FLIGHT and The AIRCRAFT ENGINEER

First Aeronautical Weekly in the World : Founded 1909

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The Outlook

The Atlantic Battle

IN our issue of January 7th we commented on the need for more intensive efforts against the U-boat. Since then a statement has been made in America that Germany now has 100 U-boats operating in the Atlantic, which probably means that she possesses in all some 400 of these pests. It is some sort of comfort to know that Britain and the United States between them are building ships faster than the U-boats can sink them, but that does not save the precious cargoes and precious lives that are lost when a sinking occurs. The real need is to sink or otherwise scotch the U-boats faster than they can be built.

In the present issue of *Flight* there is a review of the latest official publication, *Coastal Command*, which publication shows what a great effort that Command is putting into the war against enemy underwater attack on British shipping. The question arises whether that Command gets sufficient help in the struggle from Bomber Command. The latter, of course, has to take its orders from higher authority, and we cannot but wonder whether that authority gives sufficient priority to the campaign to maintain our seaborne communications. We all know that Russia must be helped, and Bomber Command tries its utmost to prevent German production being used against the Russians. But, if the U-boat is not mastered, Russia will suffer as well as ourselves—that point needs no labouring.

In fighting the German submarine, bombers are faced with difficulties. The pens in which the craft are built are protected with thick concrete and may be actually bomb-proof. That cannot be true of all the facilities in the construction yards, and there are other ways of checking production besides actually destroying the pens. The matter is very grave, though only the highest authorities know how grave. The lists periodically published by the Post Office of mails lost by enemy action give the public some idea of what is going on.

To us it appears that the time has come when something like 75 per cent. of the efforts of Bomber Command ought to be directed towards checking the production and operation of the U-boats. No other bombing policy can be of such immediate importance to the war effort of the Allies.

Breaking the Vicious Circle

THE subject of post-war civil aviation is exercising nearly every section of the British aviation world. Where, a few months ago, no one appeared to be in a mental state to think of anything but war flying, recent weeks have wrought a marked change. Wherever one goes, members of the aviation community are turning over the many problems in their minds, are discussing the difficulties and, in a few cases, are suggesting possible solutions.

As is but natural in the circumstances, there is a vicious circle to be broken: The aircraft manufacturer cannot begin to plan his types until he knows what sort of routes will be operated, the length of stages to be flown non-stop, and the size of pay load required. These answers the aircraft constructor would like to obtain from the actual operator, but until one or more "chosen instruments" are selected, practically the only existing operator is British Overseas Airways Corporation. And since it does not follow that the corporation will be the only "chosen instrument" (in fact, there appears to be a preponderance of opinion that after the war we must get away from monopolies), guidance from that source may not be altogether adequate. It then boils down to this, that the vicious circle cannot be broken until the Government makes a clear pronouncement on broad policy, at least; and so far the Government spokesmen

have been notable for the vagueness of their replies rather than for "coming down to brass tacks."

While the Government is making up its mind, many sections of the community are becoming anxious about the position, and one result has been that the subject of post-war civil aviation has come under discussion by considerable numbers of bodies, groups, chambers of commerce and so forth. More than one unofficial committee has been established with the purpose of examining the problem and trying to stir the Government to action. One of these committees, under the chairmanship of Capt. A. G. Lamplugh, has been in existence since last September, although it has preferred to keep itself "secret" until now. The names of the members of the Lamplugh committee are familiar in British aviation, where they are all known and respected, but we do suggest that post-war civil aviation is far too large a subject to be tackled by an unofficial committee composed entirely of men who have no practical experience of operational problems.

What, we suggest, is really wanted is to get together a committee on which are represented the different transport industries, shipping, railways and roads in conjunction with aircraft and airline interests. They, and they alone, have the knowledge of traffic conditions and problems. Between them they have the statistics which show the volume of traffic on all routes, the distances which it is necessary to cover non-stop (we are here thinking chiefly of Empire routes and the shipping lines), the relationship between incoming and outgoing traffic, and the seasonal changes of such traffic.

To us it appears that the first step is to obtain the views of potential operators, and in the first line of them we count the shipping companies; the aviation community can then step in and say what is or is not possible from the flying point of view.

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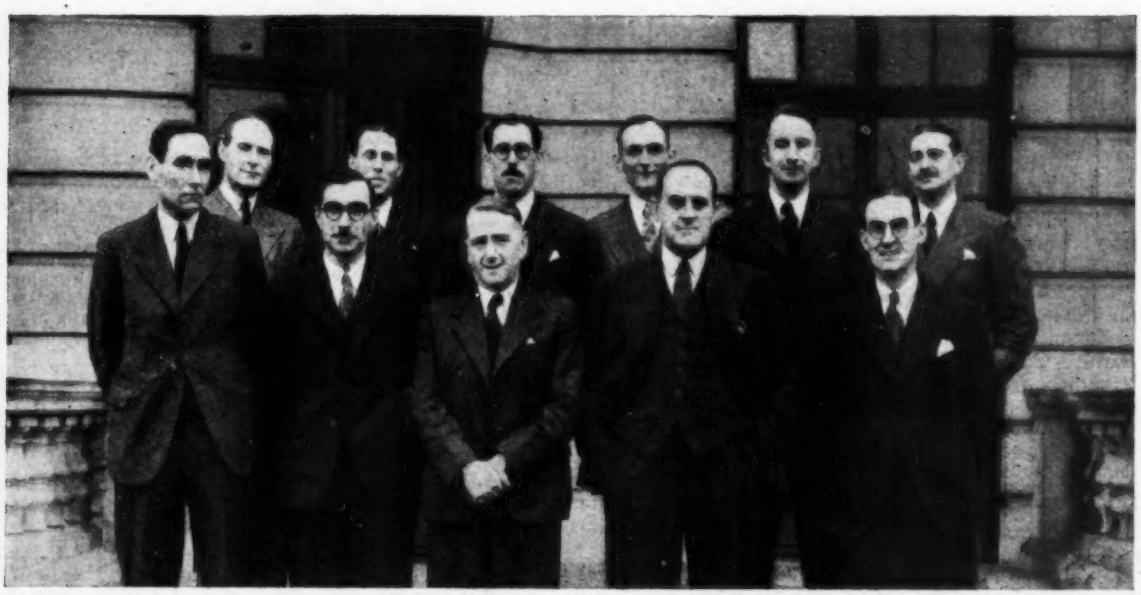
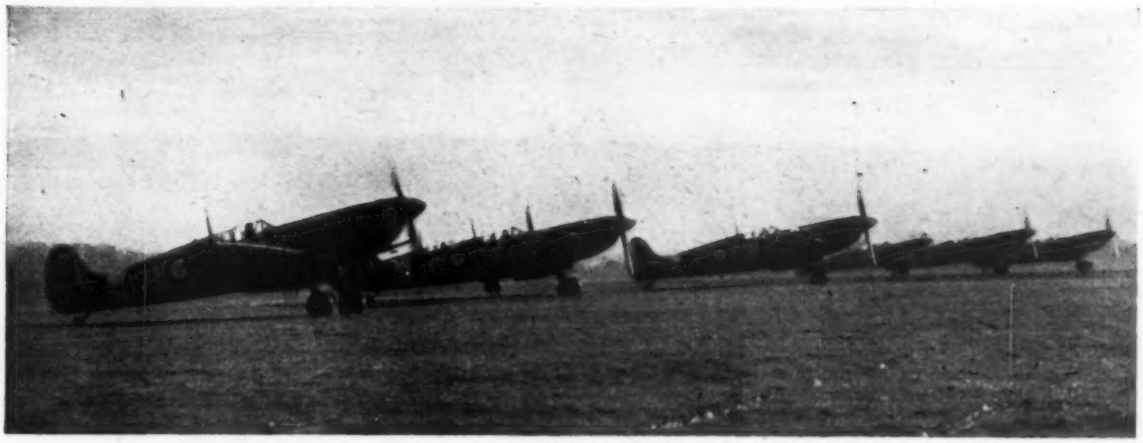
Berlin Bombed Again

THE people of Berlin, as well as those in the rest of Germany, have been waiting for months to hear that Hitler's promise about the certain capture of Stalingrad had been fulfilled. Hope deferred proverbially maketh the heart sick, and when Dr. Göbbels began to admit that the German Sixth Army was defending itself heroically against Russian attacks, the spirits of the Berliners must have begun to sink. Yet they probably felt safe, for they had not been bombed for 14 months.

At that moment of undoubtedly growing misgivings the Royal Air Force assailed their city on successive nights with bombs of 8,000 lb. weight, varied by the by-no-means contemptible ones of 4,000 lb., and mixed with tens of thousands of fire-bombs. The moment was well chosen, and the infliction of the raids on spirits already beginning to sink must have been very great.



THE FEDDEN ENGINEERING MISSION : A photograph of the aircraft engineering mission which has been sent to America by the Ministry of Aircraft Production. It is headed by Sir Roy Fedden and has already arrived in Washington. Members of the mission will confer with American aircraft producers on the co-ordination of British and American design and practice. *From left to right, back row :* Mr. C. G. A. Woodford (M.A.P.), Mr E. M. A. Leggett (R.A.E.), Mr. M. B. Berks (Production Engineering Ltd.), Dr. W. Tye (R.A.E.), Mr. W. W. W Downing (Gloster Aircraft Co. Ltd.), Mr. S. P. Woodley (Vickers Armstrongs Ltd.). *Front row :* Mr. B. G. Markham (Bristol Aeroplane Co. Ltd.), Mr. I. G. Duncan (M.A.P.), Mr. J. Lloyd (Armstrong Whitworth Aircraft Ltd.), Sir A. H. Roy Fedden, Mr. N. S. Muir (R.A.E.).

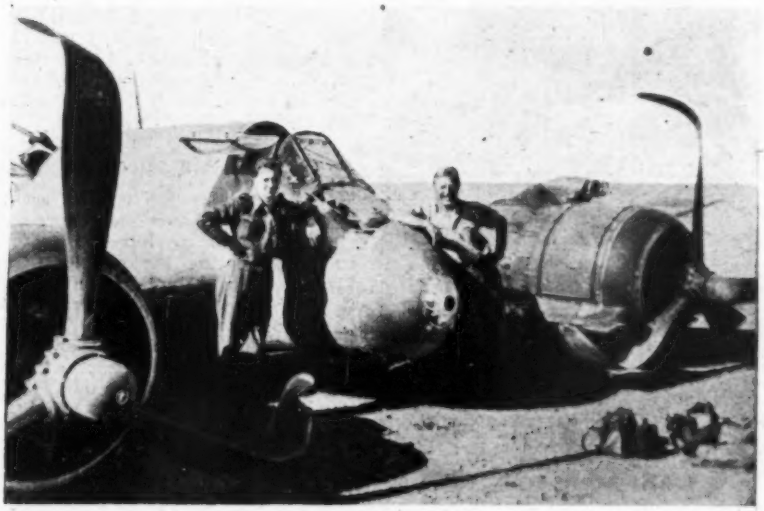


Spitfire IXs of Fighter Command all set for a formation take-off prior to a sweep over Northern France.

WAR in the AIR

The Doughty Fortress : Losses of the Luftwaffe : The Ruhr Diligently Hammered : Sandstorms and Sleet in Tripolitania

THE exploits of the Fortresses continue to amaze everybody, and the *Luftwaffe* must hate and dread them in much the same way as it hates and dreads the *Schpitfuer*. Last week a formation of Fortresses from French Africa made a daylight raid on the airfield of Castel Benito, which lies to the south of Tripoli. One may note in passing how the bombers of the Eighth Army and those of the United Nations in French Africa are now overlapping in their raids. Rommel's forces and those in Tunisia are being hammered from both sides. This raid destroyed at least 20 aircraft on the ground, besides blowing up buildings. As the Americans returned they were assailed by some 20 to 30 Me 109 fighters and a running fight went on for an hour and a quarter. No fewer than 14 of the German fighters were shot down, and others were damaged, while the Americans lost only one bomber during the day. At this stage of the war the Axis cannot easily afford to lose 34 machines at one fell swoop.



FLYING BOOTEES : The crew of a Beaufighter shot down by A.A. fire while strafing Rommel's transport west of Sirte. They trekked for 16 days behind the enemy lines before being picked up by an armoured car patrol. This is the first photograph showing a Vickers K gun being used as rear armament on a Beaufighter.

Yet that was not the full tale of the *Luftwaffe's* woes. Either on that day, or perhaps it was the previous day, far away in the region of the Caucasus, where the Russians are pressing forward with tremendous impetus towards important places in the plain of the Kuban river, their bombers raided Krasnodar, the capital of the province and an important railway junction, and claimed to have destroyed 40 aircraft on the ground. The attack seems to have taken the Germans by surprise. Since winter began aircraft have not been much mentioned on the Eastern Front, and much of the work which they usually do has been left to swarms of Cossack horsemen.

Naturally, in winter conditions, even though this winter is said to be less severe than that of last year, the internal-combustion engine loses some of its supremacy, and flesh and blood can move and strike where aircraft and mechanical vehicles are at a disadvantage. This flexibility in the Russian use of alternate arms according to the season will provide much study for Staff Colleges after the war, when the full facts are known. None the less, Stormoviks have been harrying the crowded roads along which the Germans have been retreating in the direction of Rostov, and the Germans have mentioned the use of aircraft by the Russians on the northern sector, to the east of Lenin-

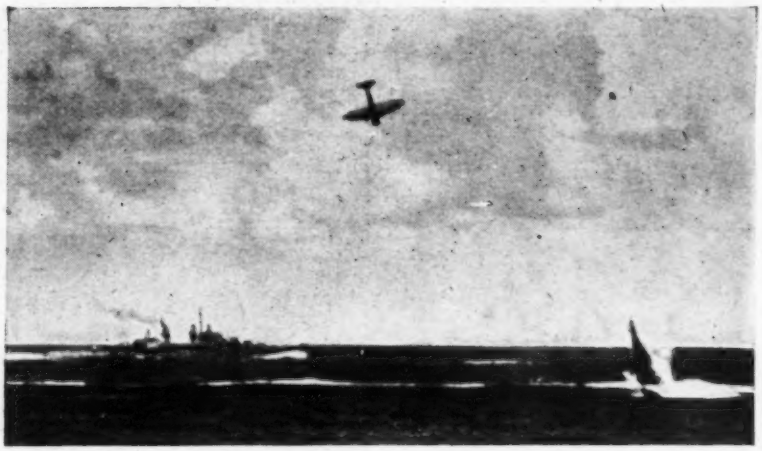
WAR IN THE AIR

grad. There the weather must be much more severe than in the south, and ground crews must have a terribly trying task in keeping engines and airframes in serviceable condition. Still, whatever the difficulties of the Russians, the Germans, who are not natives of the country, must find those same difficulties many times harder.

African Weather

A WELL-KNOWN missionary hymn speaks of "Afric's sunny fountains," and possibly many untravelled Britons have taken their general impression of Africa from that line. Such readers must be amazed to read of sleet mixing with driving sand in Tripolitania and hampering air activity. In Tunisia things are now even worse, for the surface of most flat ground is inches deep in slimy mud, and in some cases aircraft cannot be dispersed in the normal way, but have to be parked on the solid runways.

As a result, apart from the raids by Fortresses mentioned previously, heavy bombers have been fairly quiescent of late, and when an airfield is raided the machines standing on it are often helpless victims. Light bombers and fighters, however, do manage to get into the air in numbers, and Air Chief Marshal Sir Arthur Tedder has kept his light bombers busy in attacks on enemy ground targets. They have been met by Me fighters, even as the Fortresses from the west were met, and there have been fierce air battles. The machines from Tripolitania are not left without fighter protection, and



IN QUICK SUCCESSION: A remarkable photograph, taken during the battle of Santa Cruz, showing a Mitsubishi T96/2A navy fighter-dive-bomber at the point of hitting the water and, on the right, the splash from the impact of another Japanese aircraft.

that has proved very effective. Allied air losses have not been nearly so heavy as those of the enemy in the air, while there has been no mention of ground losses on our side to counterbalance the heavy destruction wrought on Axis landing grounds round Misurata and elsewhere.

Co-operation of forces in the sphere of the Western Mediterranean now presents an interesting picture. To the west, General Eisenhower is Commander-in-Chief of all Allied Forces of all arms and Services, and General Anderson and Air Chief Marshal Welsh are his subordinate officers, as well as General Spaatz, who now commands the American Army Air Force in that region. So, too, is Admiral Cunningham, though he, in his turn, is over both British and American naval forces in the Western Mediterranean. To the east, General Alexander is Commander-in-Chief of Allied ground forces. Air Chief Marshal Sir Arthur Tedder has not been subordinated to him, but has received from the Minister of Defence (Mr. Winston Churchill) general directions to carry out Army requirements. There is a distinction, though probably not much difference in practice, between the positions of Tedder and Welsh. A.V-M. Park, in Malta, is subordinate to Tedder, but has in many ways a free hand. It all sounds very complicated, but apparently it works. At any rate, the whole trend of events is towards unity of command, which is a very good thing. We may recall that in 1918 the Independent Air Force under General (now Lord) Trenchard, though it was not under the orders of Lord Haig, was under the command of the generalissimo, Marshal Foch. We have made progress since 1918.

COASTAL COMMAND INVESTIGATES: A photograph of a Hipper class cruiser in the docks at Brest. This picture—taken from 500ft. over one of the most heavily defended harbours on the Continent—is typical of many of the photographs appearing in the new publication dealing with the work of Coastal Command. A review of this book appears on page 64.

Naval Air Successes

THE Admiralty has not yet ascertained the number of enemy aircraft destroyed by forces under its command during the operations in French Africa, but elsewhere the record of successes during 1942 has been very satisfactory. The A.A. fire from ships (naval and merchant) and from naval aircraft destroyed 339 enemy aircraft for certain, and damaged a further 268, of which at least 84 are regarded as probably destroyed. The gunners on ships were responsible for 227 machines, and naval aircraft accounted for 87, mainly in the Mediterranean, besides damaging another 70. Of course, these figures are lower than those of the R.A.F., but naval fighters were very largely responsible for getting

ENEMY AIR LOSSES TO JAN. 16th.

	Over G.B.	Over Continent	Middle East
Jan. 10	1	0	1
,, 11	0	0	6
,, 12	0	0	5
,, 13	0	3	4
,, 14	0	0	8
,, 15	3	0	1
,, 16	0	0	1
	4	3	26

Totals : West, 6,541 ; Middle East, over 5,180.

convoys through to Malta, and that is the measure of their success rather than the number of enemy machines destroyed. Naval fighters are, very strictly, defensive weapons.

A U-boat Base

IN the first fortnight of January Bomber Command made a series of raids on the Ruhr, but for reasons best known to itself most of them were not heavy.* We may presume that the weather had something to do with that, for it certainly was not ideal for bombing operations. Even so, these raids must have caused a useful amount of interruption of the German war effort, and they must have also done some definite damage to factories.

Then, on the nights of January 14th and 15th Bomber Command turned its attention to the submarine base at Lorient. U-boats can never receive too much attention from the R.A.F. and the Navy. Underwater craft are not constructed at Lorient, but it is the most important base for them in France. Two heavily concreted pens have been made there, and a third is under construction. Each pen will accommodate ten boats, which can be overhauled there without having to return to a port in Germany. In addition to the pens there are dry docks, power stations, barracks and other buildings connected with the U-boat campaign. The place is strongly defended. The British bombers, defying intense cold and ice, succeeded in doing a good deal of damage with comparatively light loss to themselves.

OVER MADAGASCAR : A flight of Westland Lysanders which has done much good work in the Madagascar campaign. It has performed anti-invasion and anti-submarine patrols as well as close-support bombing for the Army during the advance southwards.

Berlin Bombed Again

THEN Bomber Command switched over to another target—Berlin. The enemy capital had had peace since November 7th, 1941, but on the night of Saturday, the 16th last, a strong force of our heavy four-engined bombers raided the place, and the attack was repeated.

BRITISH & U.S. AIR LOSSES TO JAN. 16th

	Over G.B. A'crft.	Over Continent B'brs.	Over Continent F'trs.	Middle East A'crft.
Jan. 10	0	0	0	1
,, 11	0	1	1	3
,, 12	0	1	0	2
,, 13	0	4	3	8
,, 14	0	2	0	13
,, 15	0	2	3	1
,, 16	0	1	0	1
	0	11	7	29

Totals : West, 5,035 : Middle East, about 2,038.

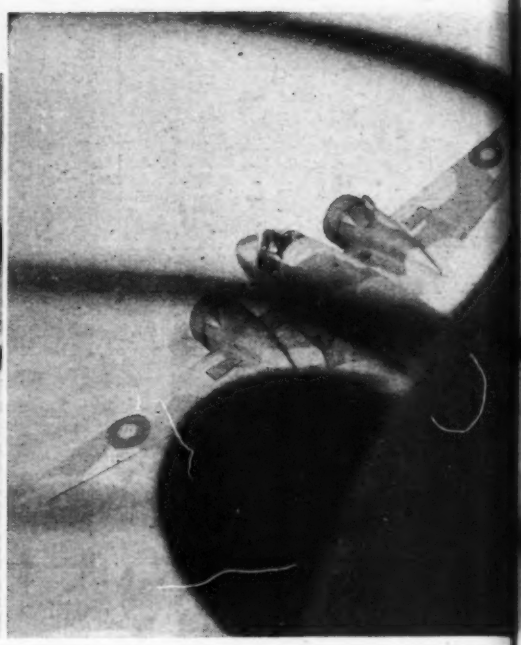
The Germans had evidently moved a lot of their *flak* away from the capital, which points to difficulties in production and urgent claims from elsewhere, and the British machines did not suffer much inconvenience or heavy casualties. Many bombs were dropped, including some of 8,000 lb., besides many thousands of fire-bombs.

On the Sunday night the defences seemed to have been strengthened, and the R.A.F. lost 22 bombers, which is not more than could be afforded.

The *riposte* to this Saturday raid was a reprisals raid by the *Luftwaffe* on London on last Sunday night. It seemed to have been hurriedly organised by the few formations left in Northern France, for it was not heavy in any sense of the word, and was very dispersed. A good many of the raiders seemed to be fighter-bombers. London's defence was terrific, and the latest devices were used. The raiders wandered about, trying to avoid the A.A. fire, and dropped their bombs without any discernible plan. The raiders lost ten or more machines, which must have been a high percentage of the machines they sent over.

RUNWAY OBSTRUCTIONS : German anti-tank mines which had to be located and removed from the airfield at Marble Arch before our aircraft could use it.

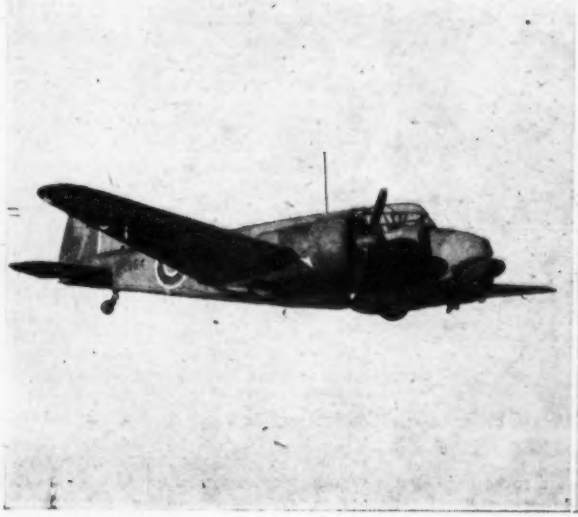
TWIN-ENGINED TRAINER . . . . .

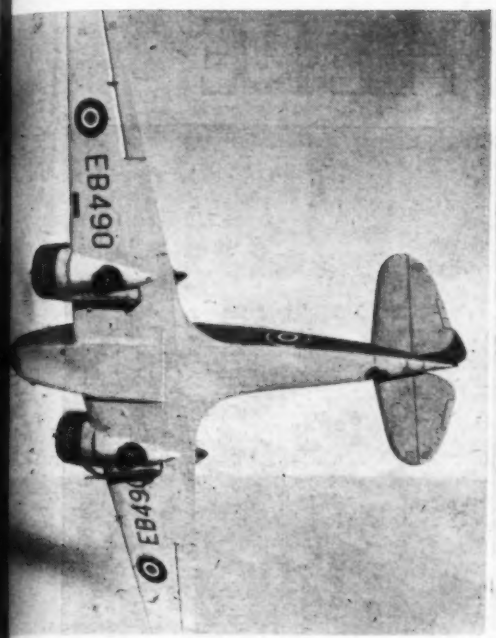


Airspee

ON these two pages are special sets of photographs take by our chief photographer of the Airspeed Oxford i its most recent stages of development.

The top series of pictures shows the Mark V Oxford in th hands of Mr. R. E. M. B. Milne, who is seen seated at th controls in the centre photograph on the left-hand page. Th Mark V, it will be remembered, is powered by two 450 h.p Pratt and Whitney Wasp Juniors (A.N.6.B), with two-positio controllable-pitch Hamilton Standard airscrews. A certai "wrigglyness" of outline of the machine in the top lef hand photograph is caused by the shot being taken at a ver acute angle to the transparent roof of the Oxford from whic the picture was taken.





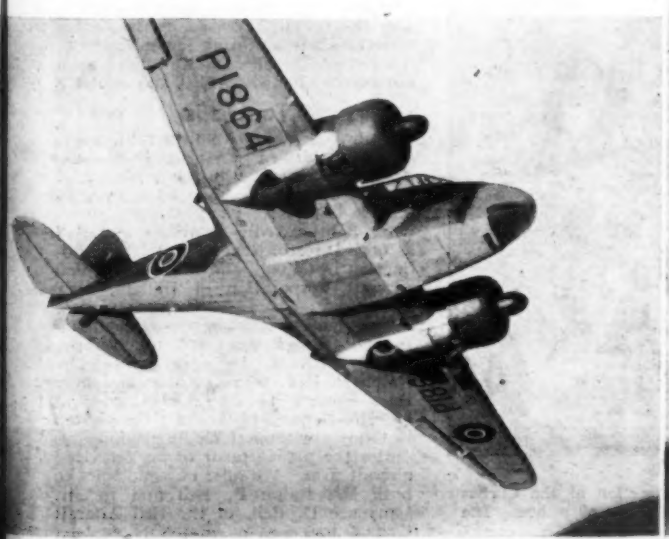
Oxford

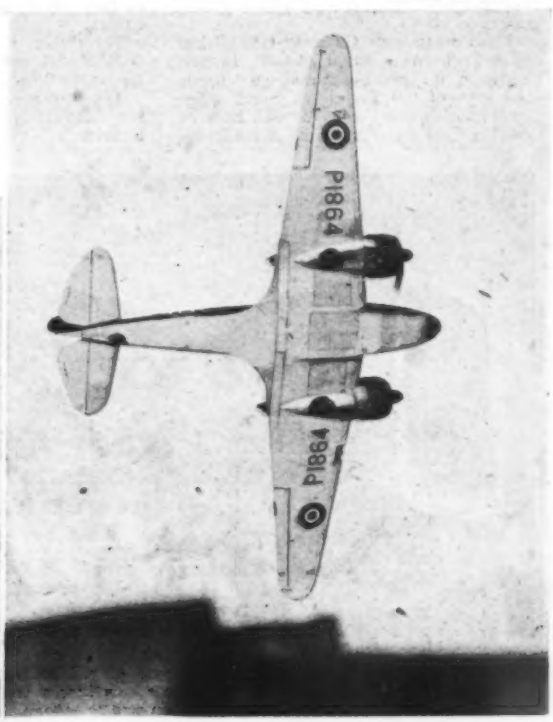
The Latest Editions of the Standard R.A.F. Twin-engined Trainer in the Hands of Two Airspeed Test Pilots

The Oxford at the bottom of the page has not yet received its official mark number. It has Armstrong Siddeley Cheetah XV engines with the new Rotol, fully-feathering, two-bladed airscrew which was described in our issue of July 30, 1942.

For these photographs this new type was being flown by Mr. R. E. Clear. They are self-explanatory, but it is interesting to note in the bottom left-hand picture that the starboard airscrew is stopped and fully feathered.

The Airspeed Oxford has been the standard twin-engined trainer of the Royal Air Force for several years, and is one of the few training types to have seen operational service. As a light bomber it carries two 250-lb. bombs on external racks.





HERE AND THERE

400-ton Flying Boats?

MAJOR SIR HUBERT YOUNG, late Governor of Trinidad, speaking in London recently said, "Unless we are ready to put into operation regular services of giant passenger aircraft of 200, 300 or 400 tons other Powers will get in before us. I believe that the future of Imperial communications in the air lies in the flying boat and not in landplanes."

Supply Containers

TO supply their troops with water or their aircraft and vehicles with fuel, the Germans are using new containers. It is said that they can be dropped from the air without damage, and, since they have no projecting handles, are very economical in stowage space in the aircraft. These cans have helped to get the enemy out of several tight corners. They have been nicknamed "Jerricans."

Changes in Awards

THE Air Ministry announces that the King has been graciously pleased to approve:—

That the Conspicuous Gallantry Medal shall be available for airmen for gallantry in air operations against the enemy. The award will be superior to the Distinguished Flying Medal.

That the Distinguished Conduct Medal shall be available for airmen for gallantry in action on the ground.

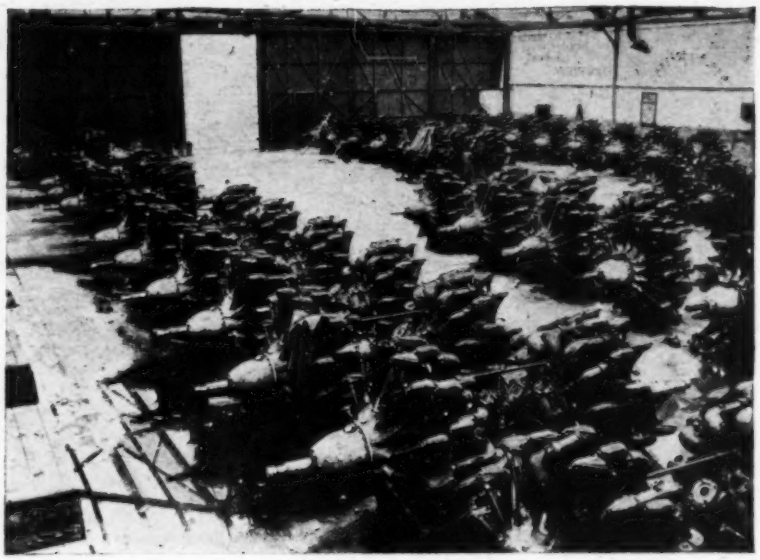
That the Conspicuous Gallantry Medal as well as the Distinguished Flying Cross, Air Force Cross, Distinguished Flying Medal and Air Force Medal shall be available for Army personnel engaged on flying duties (e.g., as glider pilots, observers, etc.).

The Conspicuous Gallantry Medal has hitherto been a naval award, though available for non-commissioned officers and men of the Royal Air Force when serving with the Fleet. It will now be available, as a flying award, for warrant officers, non-commissioned officers and men of the Royal Air Force wherever serving, and also for corresponding ranks in the Army.

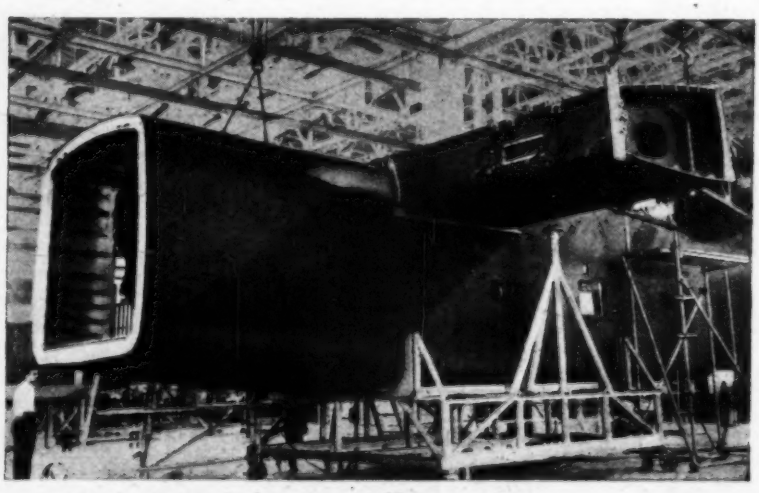
When awarded to naval personnel the Conspicuous Gallantry Medal has a white ribbon with dark blue marginal stripes. When awarded to personnel of the Royal Air Force and the Army, the ribbon will be light blue with dark blue marginal stripes.

The ribbon of the Distinguished Conduct Medal willl be the same for the Royal Air Force as for the Army.

The Military Medal will be available for Royal Air Force personnel as hitherto.



POWER FOR THE ALLIED CAUSE: A hangar full of Gnome-Rhône radial engines found undamaged on a North African airfield.



CARAVAN CONSTRUCTION: A close-up of the centre section of the Curtiss Caravan showing how the front and rear spars form the sides of a box. The flap hinges can also be seen.

Civil Aviation

IN September of last year an unofficial committee of investigation was formed under the chairmanship of Capt. A. G. Lamplugh to look into the whole field of civil aviation. Members of the Lamplugh committee are: Messrs. O. E. Simmonds, M.P.; W. C. Devereux; Leslie Irwin; Alonzo Limb; G. H. Dowty; H. E. Nicholls; A. J. A. Wallace Barr; and P. Masefield, hon. sec. During its meetings the committee has received advice from the following: Capt. H. H. Balfour; Mr. W. P. Hildred; Mr. W. L. Runciman; Mr. John Elliot; Major R. H. Thornton; Sir Frederick Handley Page; Sir Frank Spriggs, Mr. Arthur Gouge; Sir Alan Cobham; Dr. H. Roxbee Cox; Capt. Spry Leverton. The committee hopes to receive advice during future meetings from a number of well-known authorities, British, Allied and neutral.

Two Bells

IN our issue of November 19th, 1942, we published a picture of Mr. Ralph P. Bell seated in the dorsal turret of the Lancaster which was flown to Canada last year. The inscription somewhat lightheartedly described Mr. Bell as both Director-General of Aircraft Production in Canada and head of the Bell Aircraft Corporation of Buffalo, New York.

This somewhat incongruous combination of duties has, not unnaturally, called forth a disclaimer from Mr. Ralph P. Bell, who probably has more than enough to do at his post of Director-General of Aircraft Production in Ottawa without including among his duties the management of an American aircraft firm. We offer our apologies to both Mr. Ralph P. Bell and to Mr. Lawrence D. Bell, of the Bell Aircraft Corporation.

Bombing Tactics

An Outline of the Methods Adopted by the Soviet Air Force to Combat Enemy Anti-aircraft Defence

By LT. COL. GEORGI SHCHETCHIKOV

This Article was Cabled Specially to FLIGHT from the Moscow Press Service

NIGHT attacks by Soviet bombers on enemy military objectives have clearly brought out the pattern of Nazi anti-aircraft defences, and particularly of their anti-aircraft artillery. It must be borne in mind, however, that the Germans have no rigid system of anti-aircraft defences; they constantly introduce new and more perfected methods.

What have night attacks by Soviet bombers established concerning German anti-aircraft defences?

Nothing could be further from the truth than the idea that the very appearance of Soviet aircraft brings German anti-aircraft artillery into action. Enemy artillery and searchlights do not needlessly expose themselves. The beams of searchlights and anti-aircraft volleys form excellent guides for the bombers and facilitate the detection of the target. The Germans bring into action powerful searchlights synchronised with the sound locators only when they are sure that the bombers are heading for the target.

Many important objectives, particularly those far behind the lines, have no searchlights. Apparently the anti-aircraft artillery receives its range data from the sound locator posts or from observers. It is important to bear in mind that the Germans frequently erect camouflage targets and dummy anti-aircraft defences. These are usually located some dozens of miles from the military and industrial key targets. Clever lighting effects are used to create the illusion of a busy factory. As a rule these dummy factories have powerful searchlights and several anti-aircraft guns.

More often than not the enemy organises his anti-aircraft defences on the following lines: key industrial centres are sometimes protected by anti-aircraft artillery but without searchlights; a dummy target has searchlights but no artillery.

Night Tactics

Night attacks on limited target areas such as railway junctions, airfields, etc., should be organised in such a way as to detail several aircraft for operations against anti-aircraft guns and searchlights. These aircraft should appear over the target ahead of the main bombing force, or should simultaneously open machine gun fire on any searchlights or anti-aircraft guns detected, or put them out of action with bombs. The searchlights should be put out of action first, since they are more vulnerable and without them the anti-aircraft fire loses much of its effect.

The best means of overcoming enemy anti-aircraft defences are: aircraft of high manœuvrability carrying large loads of high-explosive bombs, specially designed for such operations, and large-calibre aircraft guns capable of firing at steep angles.

When the target area is covered by powerful anti-aircraft defences it is scarcely advisable to employ a special group of anti-flak aircraft. In such cases headquarters must arrange for simultaneous bombing of anti-aircraft defences by several aircraft flying on different courses in any given sector. The machines should be separated by a distance of one to three km., depending upon altitude; the greater the altitude the greater must be the distance between the aircraft. Usually the enemy concentrates his entire anti-aircraft fire on some one aircraft. This enables the other machines to bomb the target without themselves coming under anti-aircraft fire. If, however, the enemy decentralises his fire, he can keep up a barrage only, which causes but little damage to the attacking machines.

Sound Camouflage

In addition to the usual methods employed against detection by anti-aircraft posts, extensive use should be made of sound camouflage and cannon and machine gun fire from the aircraft. Thus if the aircraft approaches the anti-aircraft defence zone at great altitude, but flies over the zone at a lower speed, the sound locators, searchlights and anti-aircraft artillery find it very difficult to discover the whereabouts of the attacking aircraft.

It can only be caught by the searchlights when its engines are running at full throttle, but by this time half of the anti-aircraft zone will have been left behind and the second half, after release of the bomb load, will have been passed at top speed with more energetic evasive action in vertical and horizontal planes. This greatly reduces the time during which the machine is subject to enemy fire and upsets the range-finding calculations of the enemy gunners.

By flying at medium altitude the aircraft can effectively silence the enemy guns and destroy his searchlights by cannon and machine gun fire. Fire should only be opened by the aircraft when it is caught by the searchlights, for the machine gun fire provides a clue to the whereabouts of the bomber.

RUSSIAN AIRWOMEN

RUSSIAN women take a share with their menfolk in the operations of the Air Force. Although the number of women in combat crews is small, many of them are serving as nurses and pilots of air ambulances. In a few cases women have distinguished themselves as skilled in air fighting. One of these, Lieut. Valeria Khomyakova, a night-fighter pilot, recently distinguished herself by bringing down a Ju 88.

An outstanding example was Major Marina Raskova, famous Soviet woman flyer and Commander of an air regiment, whose death is reported from Moscow. Marina Raskova started her aviation career as a modest worker in the laboratory of the Soviet Air Force Academy, and in the course of years of hard work became an accomplished pilot and ultimately an officer of the Russian Air Force.

Her numerous flights, among them Leningrad to Moscow, Moscow to Sevastopol, Sevastopol to Archangel, made her into a popular figure in Russian life. Her experience in long-distance flights enabled her to participate as one of the all-women crew led by Valentino Grizodubova on the well-known flight from Moscow to the Far East. She was awarded the title of a Hero of the Soviet Union, the highest Russian decoration, and was twice decorated with the Order of Lenin. Since the outbreak of war Major Marina Raskova served again with the Air Force, and was one of the most successful instructors of combat crews.

D

"We Search and Strike"

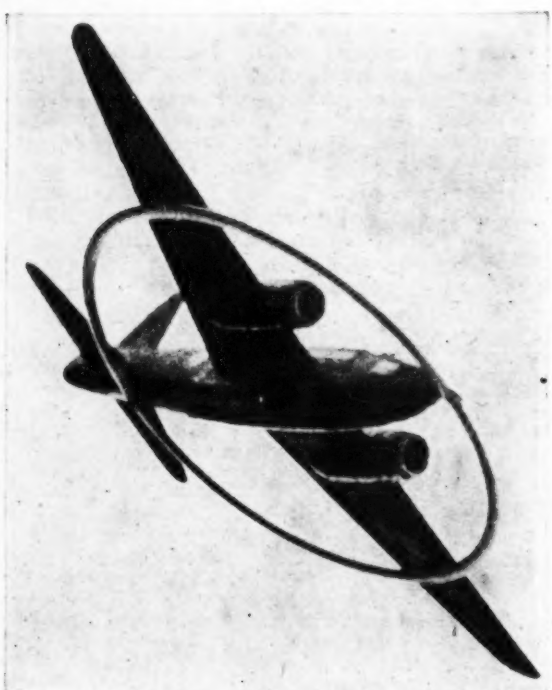
The Work of Coastal Command : Another Official Best-seller

AMONG the books issued by the Ministry of Information through H.M. Stationery Office, none is likely to take a higher place than *Coastal Command* (price 2s.). The anonymous author* must have had a very busy time in compiling it, for no Command of the Royal Air Force has a more varied list of duties, and is entrusted with more numerous types of aircraft for the carrying out of those duties. The unofficial motto of the Command is "We Search and Strike," and those two simple verbs cover a very great deal.

At the outset of the war, Coastal Command was possessed of five squadrons of flying boats (Sunderlands, Londons and Stranraers), seven squadrons of Ansons, two of Vildebeest torpedo-bombers, and half a squadron of Hudsons—in all 171 aircraft. For patrolling the East Coast of Great Britain (then comparatively quiet) it had to use Tiger Moths and Hornet Moths. Now the Command has grown out of all recognition, and includes almost every class of aircraft, except, we believe, the Spitfire class.

The book opens in dramatic style with a detailed description of the hunt for the *Bismarck*, from the time that an aircraft of Coastal Command photographed that battleship and the *Prinz Eugen* in Dobric Fjord. It was that photograph which put up the hunt. If anyone in the reading public thinks that a Government publication must be dry, this opening chapter will disabuse him of that idea and whet his appetite for more information about this Command.

Quite rightly, the book explains the organisation of the Command into Groups, one of which is stationed in Iceland, with a separate Command, which is an offshoot from Coastal Command, doing similar work off the coast of British West Africa.



A Wellington with loop for exploding magnetic mines. The magnetic field was generated by a Ford V-eight engine carried in the aircraft. Though stripped of all military equipment, the Wellington was heavy to fly and needed a take-off run of 2,000 yards. No casualties were caused through the explosion of the mines, but the machine, necessarily flying low, was often badly rocked by them. In addition to being used off the coasts of Great Britain, these Wellingtons also had the job of exploding mines in the Suez Canal.

In this connection the writer stresses the close and cordial co-operation between the Command and the Royal Navy, the latter having a general operational control over the activities of the former. Another point made is that pilots of flying boats must know almost as much about seamanship as about airmanship. In the crews of this Command the navigator, says the author, is perhaps the key man, even more than he is in Bomber Command. The one has to find a town or other land target which will not run away; the other has to find moving ships.

The Chief Enemy

The chief enemy of the Coastal aircrew is not the *Luftwaffe*, or even the weather, but boredom. For some there are moments of excitement when they share the work of Bomber Command in attacking targets on shore or coastwise shipping of the enemy, defended by *flak*. The supreme heights of delight are reached on the rare occasions when a U-boat is sighted and attacked.

But the work of the Command which takes up most flying hours is convoy patrol—"the least spectacular and the most vital" of its duties. The average length of patrol for a flying boat is about 17 hours, and during that time watches are relieved every two hours. At no moment must vigilance be relaxed. Pilots, navigators and, above all, air gunners, must be (so to speak) on their toes the whole time, and this calls for the very highest degree of crew discipline. If a U-boat is sighted the whole incident is usually over in about 45 seconds, and in that brief time a whole lot of instantaneous decisions have to be taken, and action must follow decision like a flash.

U-boats are not the only enemy at which Coastal aircraft have to strike. There are also enemy aircraft. Then there is rescue work, picking up survivors from torpedoed ships. Important personages have to be carried on special flights, enemy shipping to be attacked, and so on.

Quite rightly, the longest chapter in the book deals with convoy patrol; but if it is usually boring to the aircrew, this book makes it very interesting to the reader The accounts of certain attacks on U-boats are undoubtedly thrilling, though the author has to restrain himself from giving information which would be useful to the enemy.

Of course, the history of the Command could not be disregarded, and the book includes sufficiently full accounts of the part played by its squadrons in the Norway campaign, the Battle of France, the Dunkerque evacuation, and the attacks on the invasion ports. In these operations it could be held that Coastal Command was really lending a helping hand to Bomber Command at times of emergency. As the writer pithily remarks: "Coastal Command is not exclusively equipped for bombing." Its proper work is search.

High praise is due to the selection of photographs and maps with which this book is illustrated. A number of them, we may remark, have appeared in "The War in the Air" pages of *Flight*. The reproduction is as good as the selection, and the pictures add a great deal to the attractiveness of the book.

The book omits no side of the work of the Command, and the contribution made by the W.A.A.F. receives its due share of notice. Space forbids mention of all the activities here. We may conclude this review by quoting the words of a pilot after hours of uneventful convoy patrol: "We have helped twenty great ships to-day to bring armaments and food to England. That is our reward."

* The author is known to be Mr. Saunders, who was also responsible for *The Battle of Britain* and *Bomber Command*.

Boost Control

A Synopsis of its Action, Inspired by Recent Correspondence in FLIGHT

By WIGRAM MAXWELL, Late R.A.F. Lecturer on Carburation

THE idea is prevalent that the atmospheric change-over cock can effect boost control in the Rolls-Royce Merlin S.U. boost control unit. This is not so.

This automatic boost control unit is of the progressively variable type and is operated via a hydraulic servo piston, using the pressure-differential across the supercharger. Or, in plainer words, the negative pressure, or suction, at the blower eye is placed against one side of the servo piston, whilst the positive pressure of the blower volute is placed against the other, causing the piston to travel in the required direction and so, through linkage, to open or close the throttle valve.

When the impellor speed drops so low as to give little or no pressure-differential between eye and volute, the pressure-drop across the induction manifold (that is, the volute) and the outside atmosphere (at the carburettor intake in practice) is greater and more positive. So this is used in precisely the same way by the throttle control operating the change-over cock just near the slow-run position or actually some way before it.

The trouble, as mentioned by your correspondents, is an extension of the one experienced some time ago of boost reversal or surge, encountered usually at from "minimum-cruise" down to "slow-run," and becoming acute at "idle." This was very ably dealt with by the Claudel-Hobson people with their introduction of the Master type carburettor.

With the extreme valve overlap used in modern aircraft engines, the timing is a compromise between the varying gas velocities and attendant inertia at high and low engine revolutions, with a marked preference for the former. The factor of altitude and varying exhaust-gas back pressures also enters into it.

Gas Reversal

At low engine revolutions, and consequent low gas inertia (by reason of inlet and exhaust valves being open together in anticipation of the high inertia produced by high revolutions) a gas reversal, or false pressure, builds up in the induction manifold. This reacts on the boost aneroid chamber via the boost pick-off from the volute. This falsely compels the boost unit to close the throttle valve; then in the reversed sequence of events falsely opens it. Thus erratic control was produced.

It actually went farther than that on one particularly large radial. When the throttle was pulled back, boost reversal operating the boost unit hastily forced the throttle valve closed. Closed, remember, against the slow-run stop. Now, if the servo piston rod, working through the throttle linkage, cannot close the throttle valve farther, then it will attempt to open the pilot's throttle. It actually did so in one type of hydraulic throttle control, the pressure exerted by the servo piston being greater than that of the hydraulic line under cold conditions.

The trouble was obviated by fitting a stop. As the throttle layshaft was turned to the slow-run (the rising accelerator pump rod coming up recharging itself on the closing of the throttle) it struck the stop, which progressively depressed again the aneroid piston valve, giving a false piston position to cope with a false boost pressure (registered). And for once I believe two wrongs made a right. There exists much misconception about that simple little device, the A.B.C., whether it be the contracting aneroid type operating via an oil servo device, or the expanding concertina tube operating via a hydraulic servo piston.

Each fulfils the same purpose, namely, to restrict the manifold induction pressure within the capacity of the engine, to use that weight of fuel-air in its combustion spaces.

The first and most common error is to assume that boost is some figure necessarily higher than atmospheric. Boost is just the weight of fuel-air mixture passed into the engine. It can be below standard atmospheric pressure or above it. In English practice it is measured on a standard pressure gauge with S.A.P. scaled as Zero. The American practice is to use the mercury column.

Any normally aspirated engine, unless 100 per cent. volumetrically efficient, produces a smaller pressure (absolute) in the induction manifold, or on the engine side of the throttle, than at the atmospheric or air intake side of it.

I believe a highly efficient aircraft engine will make 14 lb. a square inch at full bore at ground level. The usual figure is much lower than this.

If this were not so a throttle valve would not work as such, and actually does not when this state of momentary equilibrium is reached in a blown engine. This is one of the reasons why a normal throttle is very sensitive at small openings and gets coarser as it is opened; the pressure-difference is falling off, and, therefore, the throttle becomes less and less effective.

Never forget that the velocity of the air stream passing through the carburettor is highest at low engine speeds. Therefore its pressure is lowest, and the velocity falls off with increase of engine speed with consequent rise in pressure.

Similarly, a supercharger may be regarded as a fuel-air transformer. The mixture is induced by the impellor displacement at the supercharger eye (the smallest area) at a high velocity and low pressure, and passed off the diffuser vanes at the volute periphery (the greatest area) at a low velocity and high pressure.

Finally, a boost control unit automatically closes the engine throttle valve to limit the blower's output to the designed requirements at low rated altitude. It will also progressively open the throttle valve as the aircraft makes altitude, when the falling weight of the fuel-air drawn through the carburettor requires a higher blower speed to maintain the desired induction manifold pressure.

The unit is completely inoperative above the rated altitude, but is at all times operative below it. Even in installations using an independent overriding device, it still operates. Its control has, however, been limited in intensity.

Ground-level Throttling

Accordingly all supercharged engines with the blower positively driven must necessarily develop their full permitted ground-level power with a partially closed throttle, and, indeed, anywhere below the rated altitude. This is a very serious disadvantage, and variable-datum or progressively variable boost resetting is used to minimise this handicap.

As in flying approximately three distinct operational power outpts are required, one of the best-known manufacturers provides three distinct boost positions merged into one.

With the throttle right forward the boost unit is at its point of minimum severity, permitting temporary excessive manifold pressures for take-off and emergency. This is known as T.O.B. (take-off boost). With the throttle control drawn farther back, the boost unit is reset to be more severe, so that although the manifold pressure is still too high for continued use over prolonged periods, it is safe for longer periods than at the T.O.B. position. This

BOOST CONTROL

is known as "Rated Boost," and because this pressure is used for the climb it is also termed the "Climb Boost" position. With the throttle still further back, the maximum severity of boost control is imposed; this permits continued use of the lowest pressure and is known as "Cruise Boost."

Without some form of variable datum, a high-altitude rated engine would be compelled to develop its full maximum ground-level horse power on the ground, drawing off the slow-run system, the A.B.C. having pushed the throttle butterfly back so far. All this, of course, applies to below the rated altitude; above it the device is completely inoperative.

In this respect it must be remembered that enrichment or cooling fuel is automatically added to the normal full-rich fuel supply at take-off boost positions. This is to prevent the fuel detonating by evaporation and consequent cooling of the charge. Thus if take-off boost position is used at above the rated altitude, where the blower is not making these ultra-high pressures, the additional enrichment fuel supply over full-rich will go a long way to wreck the motor by cylinder-wall oil dilution. Below the rated height this surplus fuel is, of course, evaporated, so acting as a coolant.

It is for this reason that in older installations T.O.B. was not obtained by the throttle being pushed fully forward, but by pulling the mixture control lever right back—this in effect mechanically overriding the boost control (*N.B.*, not cancelling it but resetting it), and at the same time bringing in the enrichment cooling fuel. Thus when flying above the rated height the mixture control would normally be in the weak, or more correctly altitude-corrected position, so that the pilot would not attempt to use T.O.B.

The Rolls-Royce Merlin S.U. operates in a similar way, but is completely progressively variable over the entire throttle range.

Both systems are compromises; both have their defects; both admit the harsh necessity of developing full power at ground level with a partially closed throttle; both succeed in keeping the carburettor from supplying the mixture off the slow-run system yet get a high-rated altitude. The higher the latter goes, the greater the danger of the former.

The obvious thing to do is to vary the blower impellor speed irrespective of the engine speed so as to produce the correct manifold pressure called for by the particular altitude and the load on the engine. The latter requirement can be provided (and is provided in one English installation) by inter-connecting the constant-speed airscrew control with the boost control, so that boost is proportionate to load on the engine and not to throttle position or engine revolutions.

The former requirement is accomplished by our enemies by using a hydraulic drive to the blower, the speed of which is automatically varied by aneroids responsive to both altitude pressure and induction manifold temperature and pressure. Fuel injection makes this easier for them, but it is not impossible for us.

Jet Propulsion

A New Book on a Fascinating Subject

FEW articles have aroused so much general interest as the series on Jet Propulsion by our managing editor, Mr. G. Geoffrey Smith, M.B.E., which we published in *Flight* from August, 1941, onwards. Requests for extra copies of the issues containing the articles were very numerous, but due to paper restrictions they could not be granted, and large numbers of readers were unable to complete their files and thus collect the series.

So insistent was the demand, and so numerous the applications, that it was decided to re-issue the series of articles in the form of a booklet. This has now been done, and the booklet is available from *Flight* offices at 3s. 6d., or 3s. 9d. post free. The title is "Gas Turbines and Jet Propulsion for Aircraft."

While in the main the new booklet contains the original articles in their entirety, the opportunity has been taken to make certain amendments considered desirable, and certain additions have been incorporated, so that the booklet can justly be claimed to deal with this fascinating subject as fully as considerations of national security permit.

Readers are here reminded that there are two distinct forms of so-called jet propulsion: In the one the fuel used embodies the oxygen necessary for combustion and is thus independent of external sources of supply. This type is represented by the rocket, and is not dealt with in the booklet. The other form is that in which the fuel requires to be mixed with air from the surrounding atmosphere; this is the form to which the booklet is devoted.

The ultimate ideal may be the plain jet-propulsion plant, in which a turbine drives a compressor and the effluent provides direct propulsion. A useful first step might be the use of the gas turbine as a prime mover for driving airscrews of orthodox type. Both systems are dealt with.

NEW "FLIGHT" HANDBOOK

"THE mass of science which serves aviation is indeed very complex, yet, unfortunately, in this country where thousands of young men are looking forward to service in the Royal Air Force, there is 'a queer kind of apologetic pride in knowing nothing about science'. . . . To future members of aircrews, flight mechanics, instrument repairers, etc., therefore, no less than to the general reader interested in flying, I commend this introductory book. It is a simple guide to aeronautics, unburdened with mathematics, and he who has the appetite to know and the capacity to learn is 'scholar sufficient'."

In the words quoted above Air Marshal Sir William Welsh, until recently A.O.C.-in-C., Training Command, sums up the essential spirit of the third edition of "*Flight* Handbook," from the foreword to which the quotation was taken. The new edition has been largely expanded by the addition of chapters on aircraft engines, superchargers and a number of recent developments. These subjects are dealt with in the same simple manner as that which characterised the earlier editions, and the new chapters, like the others, presuppose no previous knowledge of the subject. Their inclusion has widened the scope of the book, so that now it covers all the essential aspects of flying.

The price of the new "*Flight* Handbook" is 6s. net, or 6s. 5d. post free. Copies can be obtained from our offices at Dorset House, Stamford Street, London, S.E.1.

SIR WILLIAM ROOTES RESIGNS

IT is officially announced that Sir William Rootes, K.B.E., Chairman of the Supply Council, Ministry of Supply (who joined the Ministry in July, 1941), having accomplished the work of organisation which he was called upon to perform there by successive Ministers, has resigned his post.

At the request of the Minister of Supply, Sir Andrew Duncan, Sir William has agreed not to leave the Ministry at once, but will be staying to complete certain tasks, particularly in connection with his recent mission to North America.

The Air and the Commonwealth—NOW!

A Complete Change of Policy Needed : Planning on the Grand Scale Demanded : Overhaul Research and Development

By F. G. MILES

BEFORE the war an excuse that was often offered for the lack of progress in our use and design of aircraft was that, compared with the U.S.A., we had little opportunity or necessity for fast aircraft and extensive services. In America, it was said, the distance between towns was so vast that it paid to travel by air; in England, and even between England and Europe, distances were small, and the time-saving by faster aircraft unimportant.

Also, an entirely false relationship was assumed between slowness and safety-plus-economy by those who had control of design and policy. It has since proved indeed lucky for us that the penchant for slow but sure biplanes was not imitated by the military designers and by a far-sighted air staff. But the very basis of any argument that America's wide spaces conduced to better aircraft and more paying and popular airlines than our own rested upon a most obvious fallacy. England, because of the scattered and wide-flung Commonwealth of Nations, had a far greater opportunity, a far greater task and a far greater obligation than the U.S.A. These she almost entirely neglected.

THE author of this article became known, at an early age, as the designer of Phillips and Powis aircraft. He now controls, in conjunction with his wife, the destinies of that firm, but he has by no means exhausted his youthful enthusiasm, and here he pleads for vigorous action to ensure this country's place in post-war aviation.

It is true that late in the day some magnificent flying boats were ordered and built by Shorts; but in the meantime letters were carried over the British Empire by faster and better organised Dutch airlines, using American aircraft. And those countries which bought their aircraft abroad turned to America for transport planes, seldom or never to England.

No Time to Lose

Our task is urgent, immediate; it brooks no delay. Unless *we act now* we shall find we are too late to take an equal part in the aircraft manufacturing industry and the establishment of airlines over the world. The general shape of post-war policies and agreements must be hammered out with the other interested countries *now*. Design, experiment, inventions and the manufacture of prototypes must start *now* or it will be too late. Success in great transport aircraft building may be of outstanding importance in war as well as in peace.

We must work together with the whole British Commonwealth of Nations in making our plans. The old Empire has been undergoing a profound modification of its origial form. There are no longer conquered lands populated by immigrants, but great, proud, free countries achieving more and more independence in every way, politically, industrially and economically.

The only certain way of maintaining the strengthening of ties between ourselves and them (ties which were weakening rapidly before the war, due to our clumsy and patronising attitude in too many cases) is to plan *now*. The war brought us together in a magnificent vindication of our common heritage of freedom, but unless we are wise and far-seeing a reaction may set in after the coming of peace.

One major factor in offsetting such a reaction would certainly be cheap, rapid, safe and mutually owned and managed air transport throughout the Commonwealth. Militarily such a widespread series of great air bases is absolutely essential as a guard against any future aggressor; economically it will form a sound bond and an incentive to mutual trade; politically it will help us to get to know each other and to keep in touch.

The first essential thing to be done if we are to make such a vision possible is to call an Air Council of the Commonwealth *now*. It may consist of one or more representatives from every dominion and colony. Held in London we could get to know everybody's point of view, designers and airline managers could meet. We could plan co-operation from a beginning of equality, for it is very obvious that we must not attempt a purely English-financed and controlled monopoly of Empire aviation. Whatever kind of Board of Control is set up, there should be no geographical or political preference. Commonwealth Airways should be controlled and managed by representatives of Australia, Canada, South Africa, Ceylon, and indeed of all the units of the Commonwealth, if success on the greater scale is to be possible. Thus we should obtain enthusiasm and build harmoniously toward a whole which would take proper account of the special requirements of different countries and peoples.

The second thing is to recognise how backward and unambitious we are and have been in our ideas about air transport and to overhaul our means of research, development and finance to start catching up right *now*.

Aeronautical University

Here the keyword is action. Let us build an airport *now* which will be useful in war and outstanding in peace. Let us endow and build an aeronautical university far more dynamic and ambitious than anything heretofore considered, and let us make sure no mistaken ideas prevent us from providing it *now* with brilliant boys and girls looking to an aeronautical future. Let us pull up the badly equipped and unenthusiastic research centres we have at present and plant them near to the central airport. Make them open to designers and inventors wanting facilities. Give the first-class men who are already there a better and higher status and add young and enthusiastic researchers. Aim towards a purpose; a practical and immediate purpose, say, of making possible an absolutely safe three-hundred-ton airliner as a long-distance job. Stop hole-in-the-corner methods on big essential jobs such as de-

THE AIR AND THE COMMONWEALTH—NOW

icing and lick the problem by devoting enough time and energy to it. (I wonder how many lives and how much money has been lost in icing crashes against the money invested in quarrelling about how to start thinking about how to start investigating a way of improving present methods of de-icing.)

Start these things *now*. Build the airport. Build the research centres. Find the students. Undertake the problems. Win the war and help the peace.

One last thing. Arrange that the Commonwealth sends its quota of students to this first British University of Aeronautics and thereafter start universities everywhere, linked to the Mother Country.

Somehow I would force everyone in power to learn a lesson from the past. I have just picked up, at random, the Report on the Progress of Civil Aviation for 1936. Under "Export Business," it said: ". . . United Kingdom aeronautical exports reached the record figures of £2,923,138, exceeding the previous record figure by nearly £200,000"! The total sum allotted by the Empire and the Sudan under the Civil Aviation votes for 1936-7 was £2,066,879, and even that was 58 per cent. better than 1935—£2,000,000—about the design and development cost of building one prototype aircraft a bit bigger than the Douglas giant bomber.

This was in 1936, when war seemed at least highly probable. It was no more difficult then to see that world air transport was within sight of being a serious rival to road, rail and sea than it is now. That such a change must provide great new industries for the foresighted and progressive nations was obvious. Capital then invested in experiment, development and technical education could not have failed to bring huge dividends for peace or war. The war might have been shortened by years—at more than ten million pounds a day!

No we must look backward with penitence before we look forward. We *must* think on a large scale. The next war will be lost in a month if we make a similar mistake in war aviation to that we made in civil aviation. Imagine if Germany had jumped five years ahead with the Lancaster and had had two thousand in operation in 1940! *It was not impossible in terms of knowledge then available.* Summing up:

1. Start inter-Commonwealth discussions and planning *now*.
2. Build the central airport, aeronautical university, new and ample research facilities *now*.
3. Encourage designers and aircraft businesses to devote a certain amount of time, man-hours and material to so-called "post-war" aircraft *now*.
4. Come to an understanding with the U.S.A. *now*.
5. Act *now* to secure properly organised air routes so that we maintain our share of passengers and goods-carrying trade abroad.
6. Act as a Commonwealth rather than as a Country.

"Unsurpassed in the Annals of the Royal Air Force"

V.C. *Awarded to Sergeant Pilot Middleton*

THE King has approved the award of the Victoria Cross in recognition of most conspicuous bravery to Aus. 402745 Flight Sergeant Rawdon Hume Middleton, Royal Australian Air Force (Missing), No. 149 Squadron.

Following is the official citation:—

Flt. Sgt. Middleton was captain and first pilot of a Stirling aircraft detailed to attack the Fiat works at Turin one night in November, 1942. Great difficulty was experienced in climbing to 12,000 feet to cross the Alps, which led to excessive consumption of fuel. So dark was the night that the mountain peaks were almost invisible.

During the crossing Flt. Sgt. Middleton had to decide whether to proceed or turn back, there being barely sufficient fuel for the return journey. Flares were sighted ahead and he continued the mission and even dived to 2,000 feet to identify the target, despite the difficulty of regaining height. Three flights were made over Turin at this low altitude before the target was identified. The aircraft was then subjected to fire from light anti-aircraft guns.

A large hole appeared in the port main plane which made it difficult to maintain lateral control. A shell then burst in the cockpit, shattering the windscreen and wounding both pilots. A piece of shell splinter tore into the side of Flt. Sgt. Middleton's face, destroying his right eye and exposing the bone over the eye. He was probably wounded also in the body or legs. The second pilot received wounds in the head and both legs which bled profusely. The wireless operator was also wounded in the leg.

Pilot Unconscious

Flt. Sgt. Middleton became unconscious and the aircraft dived to 800 feet before control was regained by the second pilot, who took the aircraft up to 1,500 feet and released his bombs. There was still some light flak and the aircraft was hit many times. The three gunners replied continuously until the rear turret was put out of action.

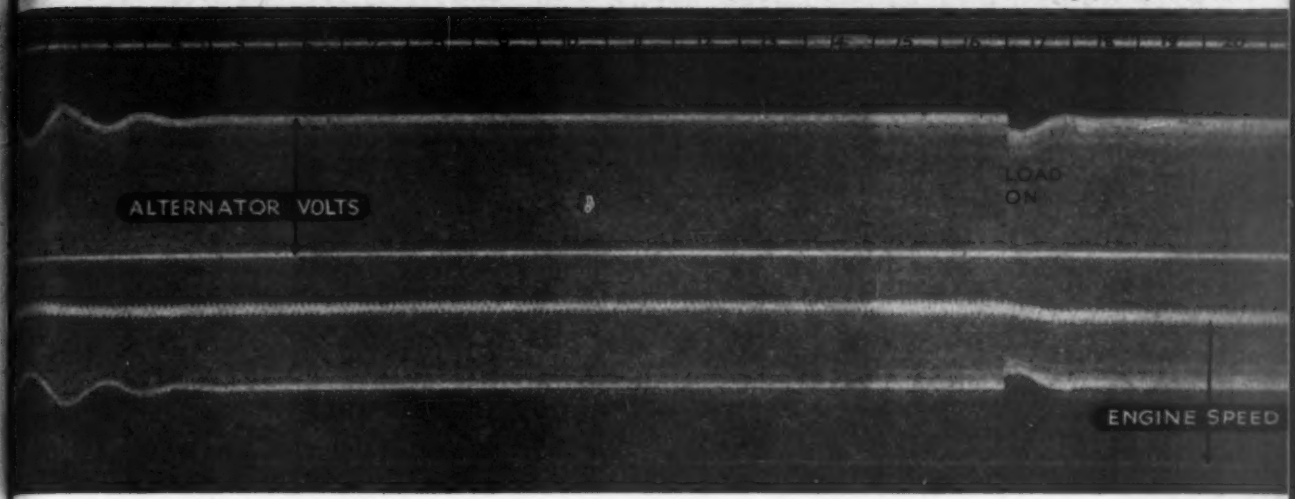
Flt. Sgt. Middleton had now recovered consciousness, and, when clear of the target, ordered the second pilot back to receive first aid. Before this was completed the latter insisted on returning to the cockpit, as the captain could see very little and could speak only with loss of blood and great pain.

Course was set for base and the crew now faced an Alpine crossing and homeward flight in a damaged aircraft with insufficient fuel. The possibilities of abandoning the aircraft or landing in Northern France were discussed but Flt. Sgt. Middleton expressed the intention of trying to make the English coast, so that his crew could leave the aircraft by parachute. Owing to his wounds and diminishing strength, he knew that, by then, he would have little or no chance of saving himself. After four hours, the French coast was reached and here the aircraft, flying at 6,000 feet, was once more engaged and hit by intense light anti-aircraft fire. Flt. Sgt. Middleton was still at the controls and mustered sufficient strength to take evasive action.

Five Minutes' Fuel

After crossing the Channel there was only sufficient fuel for five minutes' flying. Flt. Sgt. Middleton ordered the crew to abandon the aircraft while he flew parallel with the coast for a few miles, after which he intended to head out to sea. Five of the crew left the aircraft safely, while two remained to assist Flt. Sgt. Middleton. The aircraft crashed in the sea and the bodies of the front gunner and flight engineer were recovered the following day. Their gallant captain was apparently unable to leave the aircraft and his body has not been traced.

Flt. Sgt. Middleton was determined to attack the target regardless of the consequences and not to allow his crew to fall into enemy hands. While all the crew displayed heroism of a high order, the urge to do so came from Flt. Sgt. Middleton, whose fortitude and strength of will made possible the completion of the mission. His devotion to duty in the face of overwhelming odds is unsurpassed in the annals of the Royal Air Force



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For an important purpose, it was found necessary to govern a petrol engine to high-precision limits, far finer than any hitherto attained under similar conditions. Iso-Speedic solved this problem (as the oscillograph shows), providing a small, neat unit giving constancy within plus or minus 0.3% (three one-thousandths).

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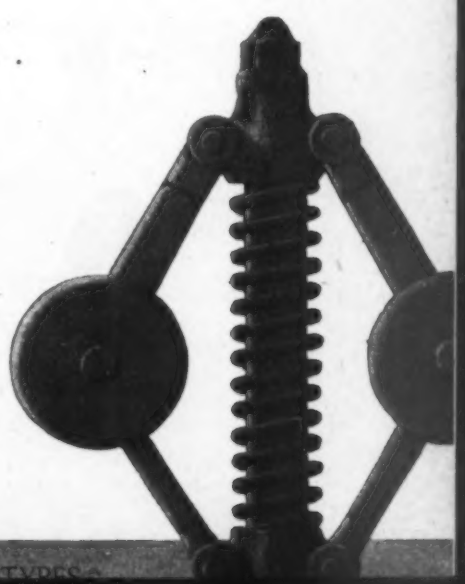

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Aircraft Types and h

VICKERS-ARMSTRONGS WALRUS II

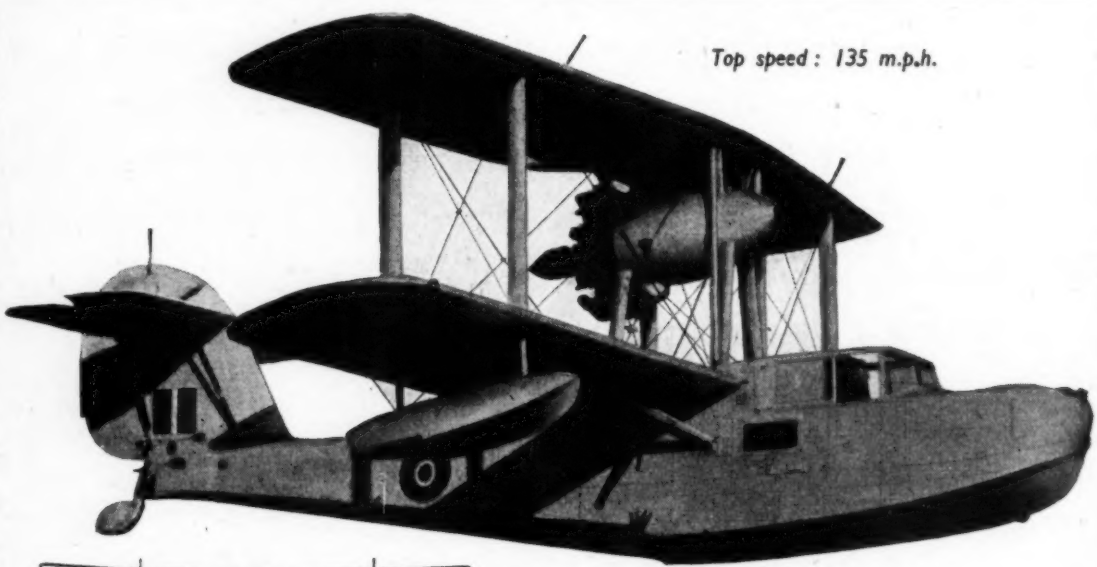
NO other aircraft in operational service to-day can trace its family tree as far back in a direct line as the Walrus II, familiarly known to the Fleet Air Arm as the Shagbat; and it is still doing valiant service in many waters, including that of ambulance duties with the Air/Sea Rescue Service.

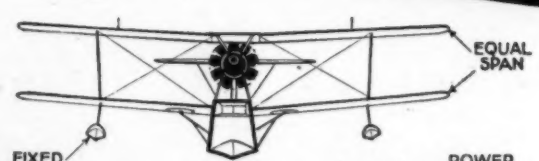
The Walrus, as we know it to-day, first made its appearance in 1935, when it was named the Seagull V (not to be confused with the American Curtiss Seagull opposite!), the first batch of which were built to an Australian order and were then supplied to the R.A.F. and renamed Walrus. The first Seagull (Supermarine) was built in 1922, and differed very little in general appearance from the present-day Walrus except that it had a Napier Lion engine driving a tractor airscrew.

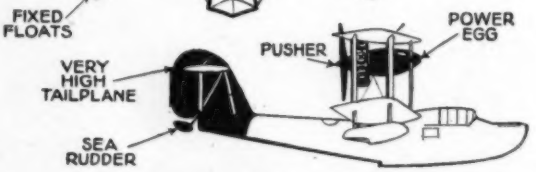
But Walrus geneology goes back even farther, and the famous line may be said to have been founded when the Supermarine Baby single-seater flying boat made its appearance in 1918. This actually had most of the chief characteristics of the modern Walrus (if one may use the term for a veteran biplane), including a pusher airscrew—in this instance driven by a Hispano-Suiza engine. In fact, not only did the Seagull V, or Walrus I, revert to the pusher style, but it also reverted to single-bay wings instead of the two-bay layout of the 1922 Seagull.

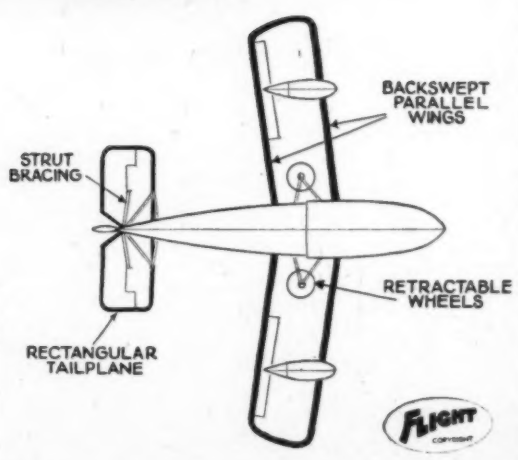
Since the present war began, the Walrus has been in active service all over the world from the tropics to the Arctic, and its range of duties, believe it or not, is recorded once to have included that of dive-bomber!—a truly frightening thought, even though it was against the Italians!

Powered by a Bristol Pegasus VI engine of 775 h.p., the top speed of the Walrus II is 135 m.p.h. at 4,750ft., and its service ceiling 18,500ft. At a cruising speed of 95 m.p.h. its range is 600 miles. Its parallel-edged, back-swept wings of equal span, high-set braced tailplane, and wheels retracting into the lower wings make it extremely easy to recognise.







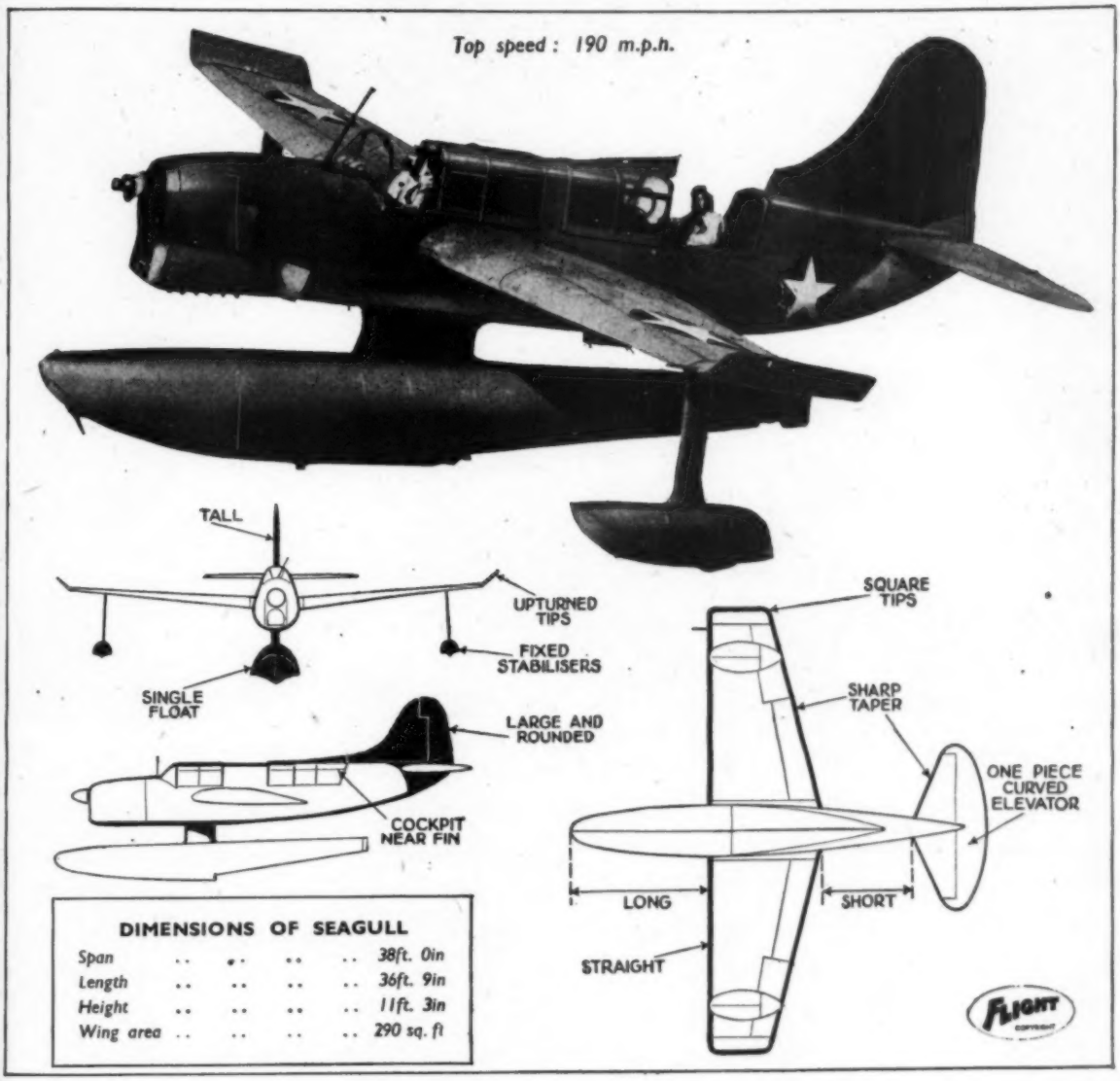


DIMENSIONS OF WALRUS

Span	45ft. 10in.
Length	37ft. 7in.
Height	15ft. 3in.
Wing area	610 sq. ft.

dheir Characteristics

CURTISS SEAGULL



DIMENSIONS OF SEAGULL

Span	38ft. 0in
Length	36ft. 9in
Height	11ft. 3in
Wing area	290 sq. ft

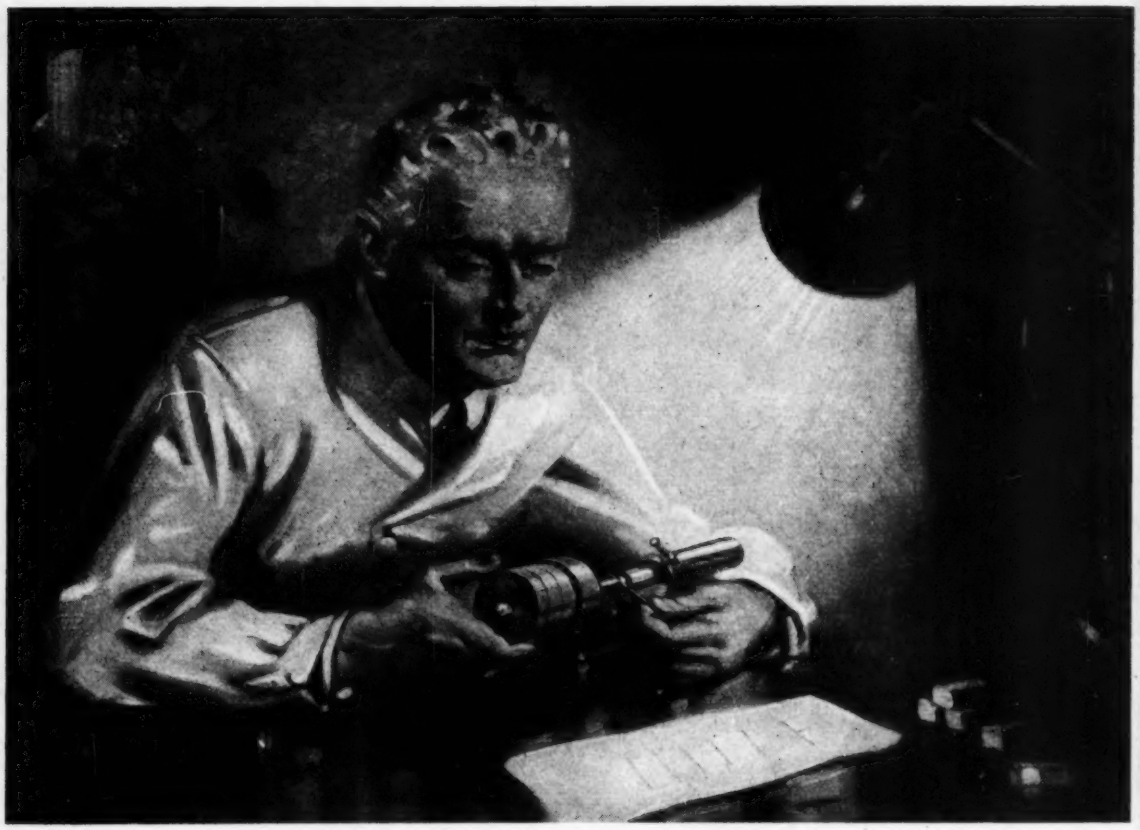
NO relation to the Walrus next door, the Curtiss Seagull, officially designated the SO3C-2 by the U.S. Navy, is also being built for the Fleet Air Arm, who have modified its name into Seamew—which is also a species of gull. Incidentally, the same machine is also being produced by the Ryan Aeronautical Company, on whose books it is known as the Ryan SOR-1 Seagull; Ryans are supplying the U.S. Navy only with this model, the British version being produced only at the Curtiss-Wright plant together with the SO3C-2 for their own Fleet. Both aircraft are identical except for certain items of equipment.

Designed for catapult launching from warships, or as a reconnaissance landplane for operation from aircraft carriers, the Seagull (or Seamew) is powered by a 520 h.p. Ranger GV-770-6, 12-cylinder, inverted "V" air-cooled engine which gives it a top speed of 190 m.p.h. at 5,000ft. Its loaded weight is given as 5,729 lb. and its weight empty as 4,284 lb. Duration is about eight hours at cruising speed.

The seaplane version, illustrated here, has a single main float extending well beyond the nose and with a single "pedestal" support; fixed stabilising floats are attached by single faired struts near the sharply upturned wing-tips which are perfectly square. The wings, which taper on the trailing-edge only, have very little dihedral apart from that presented by the upturned tips.

Another prominent characteristic for the spotter's guidance is the way in which the large single fin is carried forward over the top of the rear cockpit, a portion of it sliding forward with the cockpit cover. The landplane version has fixed single cantilever legs with spatted wheels, and a fixed tailwheel; either type is equally easy to recognise.

"There is nothing so powerful as TRUTH"
(DANIEL WEBSTER)



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Behind the Lines

Service and Industrial News from the Inside of Axis and Enemy-occupied Countries

Defensive Optimism

SPANISH newspapers report that Goebbels propaganda is attempting to set German minds at rest by assuring them that large-scale air attacks will be impossible.

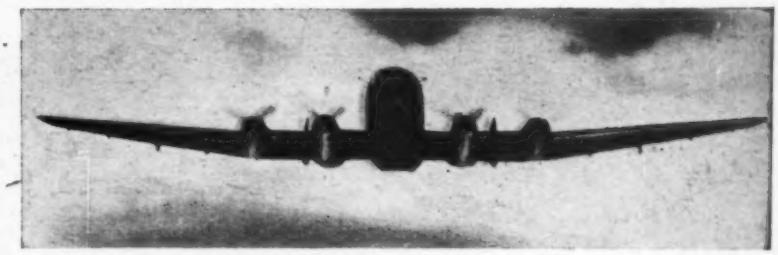
It is said that since one multi-engined aircraft consumes in a flight from England to Germany and back some 660 gallons of fuel, one raid with 20,000 bombers would require 6,000 railway tank-waggons of fuel, or the equivalent of 120 trains of fifty wagons each. This calculation—the German propaganda insists—clearly shows that large-scale Allied air attacks are impossible, and even if Germany were not able to rely on the help of Italy, her citizens ought to feel quite safe in the "impregnable fortress" into which Germany could transform herself in case of need.

The Triangle

THE slackening of German air support in Libya is explained by the strategic concentration on what is called the "Tunisian triangle," namely, Sicily-Tunis-Tripoli. Field-Marshal Kesselring, C.-in-C. of the *Luftwaffe* in this triangle, apparently considered it essential to guard the Sicilian Channel no matter at what cost, since in his opinion these waters are the key to Mediterranean and North African strategy.

It is asserted that for this reason large numbers of *Luftwaffe* units were withdrawn from Libya during November into the "Tunisian triangle." The heaviest concentrations here are said to have been at the two northern points, Sicily and Sardinia, to assist in the rapid transfer of Axis air forces to Tunisia. According to German sources this concentration of air strength is the heaviest ever attempted by the *Luftwaffe*.

The *Luftwaffe* units in this area were formed into "Air Fleet South." This new air fleet comprises units withdrawn from Russia shortly after the opening of General Ritchie's offensive, as well as a large number of transport units equipped with Ju 52s, Ju 90s and Blohm and Voss flying boats.



First photograph of the modified Ju 90 described in *Flight*, January 14th. This new version features a rectangular centre-section and tapered outer panels replacing the sharply backswept leading-edge and "broken line" trailing-edge. The Ju 90 has recently come into prominence in *Luftwaffe* operations in the Mediterranean.

By Flying Boat

ACCORDING to reports from Germany, the rapid despatch of German troops into Tunisia was made possible by a substantial number of Blohm and Voss flying boats kept in readiness at Hamburg and at Munich. These reports said that approximately a division of the "H. Goering" units stationed at Munich was transported by air from the Starnberg seaplane base at Munich together with all essential material and aviation spirit. To avoid Swiss territory, the seaplanes made an intermediate landing on the Lido, Venice, and continued to Sicily. The transport is said to have taken twenty-four hours.

The Blohm and Voss flying boats referred to in these reports include, presumably, the latest version, the B.V.222. This aircraft, a 45-ton flying boat, is equipped with six air-cooled B.M.W. 132 Dc engines of 1,000 h.p. each, and has a cruising speed of 170 m.p.h. and a range of 4,300 miles.

BEHIND THE LINES. An 88lb. bale of leaflets being loaded on a German aircraft for distribution over Stalingrad. On such operations German aircraft fly usually at 12,000ft. and the "spraying" effect of the leaflets is said to cover a radius of some 15 miles.

ERSATZ. Empty containers used for supplying German units by parachute are here shown employed as building material in the construction of a strong point of an infantry unit.

By Air

IT must be either disappointment at the non-invincibility of their arms or a sheer desire to "try everything once" that prompted the Germans to shower 100,000,000 leaflets over Stalingrad. For it is difficult to credit even the Germans with believing that it will have any effect on the fighting spirit of the victorious defenders of that city.

Our Allies in Stalingrad surely found a good use for this free gift of the Germans.

Fighting the U-Boat W

Scenes from a Coastal Command Squadron Flying Consolidated Liberators

(Left) "Time to get up sir." By the batman's oilskin coat it can be presumed that the usual English weather is prevailing outside. Crews are called three hours before take-off time.

(Above left) Members of ...ve rig... Liberator crew, detailed for ...tions ... North African convoy escor... controll... eat an early and substanti...ts the... breakfast. It will be mo...re and ... than 12 hours before they s... meet ... down to another meal. ...y are t...

...ove left ...t of cam... ...Libera... ...l attenti... ...ming pig... ...special c... o...

(Above) Breakfasted and briefed, the crew collect their paraphernalia and board the transport which takes them to the waiting Liberator.

(Left) A flight sergeant gunner at one of the two twin-gun beam turrets. (Above) A wireless operator air-gunner at the radio set.

t War

Even a big convoy is difficult to find when it is hundreds of miles from the nearest land in the vast expanse of the Atlantic Ocean. The navigator must be most careful in plotting an exact course and checking his position from time to time.

rs of ove right) In the ed for ations room with escort controller. He instantiacts them as to e mon re and when they they s meet the convoy eal. ay are to escort.

ove left) Dressed in its t of camouflage and white, Liberator receives its l attentions. (Right) Two ming pigeons are carried pecial containers in case of need.

(In Circle) The first and second pilots let the automatic pilot "George" do the work while they have a cup of coffee from a vacuum flask to break the monotony of a long, boring trip. Sandwiches, chocolate and fruit are also carried to satisfy the inner man. (Left) After perhaps 12 hours' flying over watery wastes, it is good to see the green fields of Britain underneath once more. The white underside of the Liberator which is such good camouflage when flying against a cloud background over the Atlantic, makes the aircraft stand out against a blue sky. (Above) With a sigh of relief a wireless-operator air-gunner steps from the rear turret at the end of his final turn of duty. The wireless-operator air-gunners and the flight engineer all take two-hour shifts in the rear turret, in the mid-upper turret and at the two sets of free guns used for beam protection.

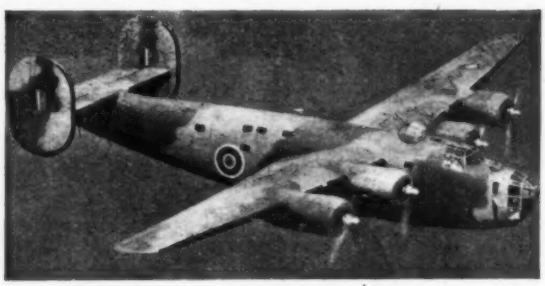
Aircraft of the Anglo-American Forces

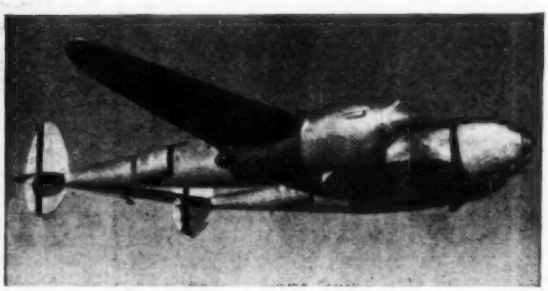
Review of British and U.S. Types in Operational Service

THIS is the third instalment of an alphabetical list of some 70 different types of aircraft of British and American manufacture, 37 of which have already appeared in the two previous issues of "Flight."

LIBERATOR III

CONSOLIDATED AIRCRAFT CORP., U.S.A. High-wing, four-engined long-range bomber in service with the R.A.F. and U.S. Army Air Force, whose official designation is B-24. Powered by four 1,200 h.p. Pratt and Whitney 14-cylinder Twin Wasp air-cooled radial engines with Hamilton-Standard hydromatic c.s. airscrews. Fitted with the very high aspect-ratio Davis wing of very large span. All-metal, flush-riveted stressed-skin construction. Can be distinguished from earlier types by oval engine cowlings and gun-turret immediately above and behind pilots' cabin. Top speed 335 m.p.h., cruising 230 m.p.h., service ceiling 36,000ft., cruising range about 3,000 miles. Dimensions: Span 110ft., length 63ft., height 19ft., wing area 1,050 sq. ft.



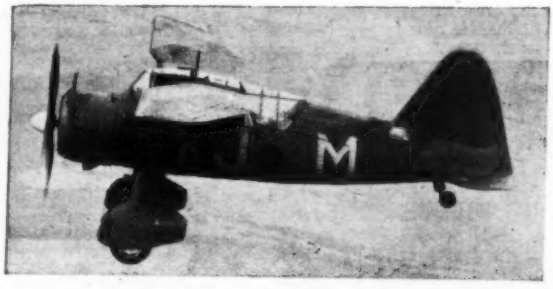


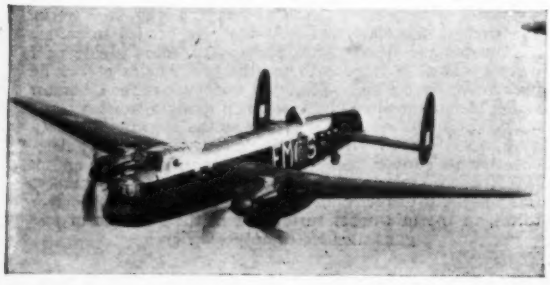
LIGHTNING

LOCKHEED AIRCRAFT CORP., U.S.A. Single-seater twin-engined fighter in service with the U.S. Army Air Force and the R.A.F. American designation is P-38E. Mid-wing twin-fuselage type powered by two Allison liquid-cooled 12-cylinder "V"-type engines, each of 1,150 h.p. Pilot is housed in a central nacelle which projects beyond the spinners. Armament in the nose and, in the American version, comprises one 23 mm. Madsen cannon, two 0.3in. and two 0.5in. Colt machine guns. The R.A.F. model, however, has more typically British armament. Top speed is said to be 380 m.p.h. at 16,000ft., cruising speed 350 m.p.h., service ceiling 30,000ft., and maximum range 1,070 miles. Dimensions: Span 52ft., length 37ft. 10in., height 9ft. 10in., wing area 327 sq. ft.

LYSANDER II

WESTLAND AIRCRAFT, LTD., Gt. Britain. Two-seater Army Co-operation aircraft in service with the R.A.F. both in Army Co-operation squadrons and the Air/Sea Rescue Service. High-wing strut-braced monoplane with fixed faired undercarriage. Powered by a Bristol Perseus XII nine-cylinder, sleeve-valve, air-cooled radial engine giving it a top speed of 230 m.p.h. at 10,000ft., service ceiling of 26,000ft., and a minimum flying speed, fully loaded, of 55 m.p.h. Two fixed forward-firing machine guns, one in each wheel spat, and twin movable machine guns on a Fairey mounting in rear cockpit. Fuselage is mixed wood and metal structure with fabric covering. Dimensions: Span 50ft., length 30ft. 6in., height 14ft. 6in., wing area 260 sq. ft.





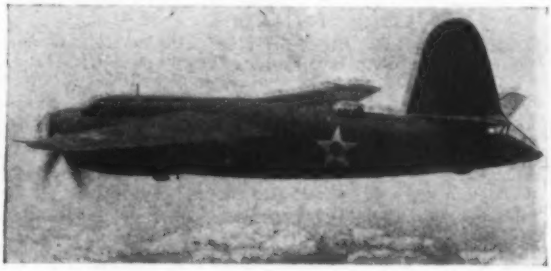
MANCHESTER

A. V. ROE AND CO., LTD., Gt. Britain. Twin-engined heavy bomber in service with the R.A.F. Powered by two Rolls-Royce Vulture 24-cylinder "X"-type liquid-cooled engines of 2,000 h.p. each, but not at present in production. Although very similar in appearance to its four-engined successor, the Lancaster, the constructional details of the Manchester differ in a number of important respects. Its fuselage is, however, only four inches shorter. Armament consists of eight 0.303in. Brownings in three power-operated gun-turrets, and its 33ft. bomb bay houses more than 5 tons of bombs. Top speed is in the region of 300 m.p.h., and range about 2,000 miles. Dimensions: Span 90ft. 1in., length 68ft. 10in., height 20ft., wing area 1,131 sq. ft.

AIRCRAFT OF THE ANGLO-AMERICAN FORCES

MARAUDER

GLENN L. MARTIN CO., U.S.A. Twin-engined medium bomber in service with the R.A.F. and the U.S. Army Air Force, who call it the B-26. Powered by a pair of Pratt and Whitney R-2800 Double-Wasp 18-cylinder air-cooled radial engines, each of 1,850 h.p., the Marauder has high wings which are set nearly amidships, and the engines are fully underslung. A top speed of more than 300 m.p.h. has been quoted in America. Defensive armament includes a bubble turret above the fuselage, aft of amidships, and a gun position, or turret, in the tail, as well as forward guns. Tricycle undercarriage is employed. Dimensions: Span 65ft., length 58ft. 3in., height 19ft.

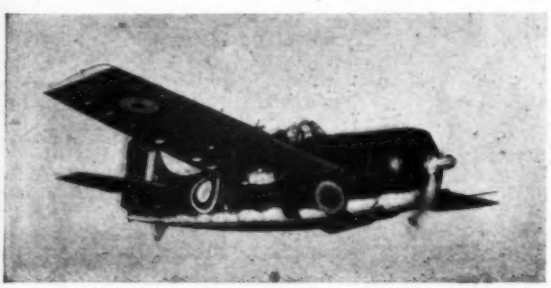


MARINER

GLENN L. MARTIN CO., U.S.A. Twin-engined patrol flying-boat in service with the U.S. Navy; official designation, PMB, the latest variation being the PMB-3 or Mariner III. Powered by two 1,600 h.p. Wright Cyclone two-row GR-2600-A5B air-cooled radial engines, which are reputed to give it a top speed of about 225 m.p.h. The gull-type wings have fixed wing-tip stabilising floats; the rectangular tailplane has a pronounced dihedral angle, and the outrigged egg-shaped twin fins and rudders cant inwards. In its latest form the Mariner has three gun-turrets, nose, tail and dorsal. Two 21in. torpedoes or the equivalent weight in bombs are carried under the wings inboard of the engines. Dimensions: Span 118ft., length 77ft. 2in., height 17ft. 6in., wing area approximately 1,330 sq. ft.

MARS

GLENN L. MARTIN CO., U.S.A. Four-engined patrol flying-boat in service with the U.S. Navy. Official designation is XPB2M-1. The Mars is virtually a scaled-up version of the PMB-1 and is fitted with four 2,000 h.p. Wright Duplex-Cyclone 18-cylinder air-cooled radial engines. It carries a crew of eleven men and is said to have a powerful defensive armament. The loaded weight is in the region of 70 tons and, as a troop-transport, it could carry 150 fully armed and equipped men. As a patrol flying-boat capable of flights of long duration, it provided considerable comfort for its crew, including separate messes and bathrooms for officers and men. Emergency equipment even includes a collapsible motor dinghy with outboard engine, as well as several rubber life-saving rafts. Dimensions: Span 200ft., length 170ft.



MARTLET

GRUMMAN AIRCRAFT ENGINEERING CORP., U.S.A. Single-seater fighter in service with the Fleet Air Arm and with the U.S. Navy as the Wildcat. Official designation, F4F-3. Both are identical except for radio and other equipment peculiar to the respective Services. Power is supplied by either a Pratt and Whitney Twin-Wasp S4C4-G engine or a Wright 9-cylinder Cyclone R-1820-G205A air-cooled radial engine, either of which develops 1,200 h.p. for take-off. Top speed is 325 m.p.h. with the Twin-Wasp and 330 m.p.h. with the Cyclone engine. Four 0.303in. wing-guns arm the Martlet, but the Wildcat has two 0.5in. guns in the cowling. Dimensions: Span 38ft., length 28ft. 10in., height 9ft. 2½in., wing area 260 sq. ft.

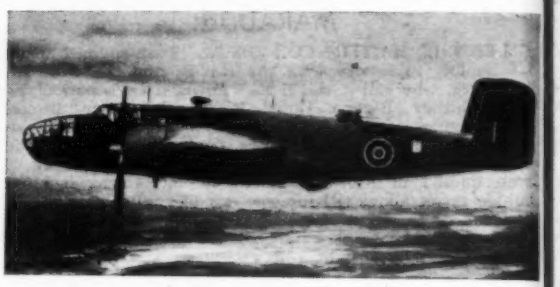
MARYLAND

GLENN L. MARTIN CO., U.S.A. Twin-engined reconnaissance-bomber in service with the R.A.F. in the Middle East. Originally built to a U.S. Army Air Force specification but not adopted, it is known to them as the Martin 167, its makers' type number. About 200 were ordered by the French and some were delivered before the collapse. Powered by two Pratt and Whitney 1,050 h.p. Twin-Wasp air-cooled radial engines, the Maryland has a top speed of some 300 m.p.h., a service ceiling of 29,500ft., and a range of 1,300 miles at a cruising speed of 250 m.p.h. Armament: A dorsal turret, a lower gun position behind the trailing-edge and four fixed wing guns; maximum bomb load is 1,250 lb. Dimensions: Span 61ft. 4in., length 46ft. 8in., height 10ft., wing area 538 sq. ft.

AIRCRAFT OF THE ANGLO-AMERICAN FORCES

MITCHELL

NORTH AMERICAN AVIATION, INC., U.S.A. Twin-engined medium bomber in service with the R.A.F. and the U.S. Army Air Force, in whose lists it is the B-25C. Powered by a pair of 1,700 h.p. Wright Cyclone two-row GR-2600 air-cooled radial engines, the Mitchell has a top speed of approximately 300 m.p.h., a service ceiling of 26,500ft., and a cruising range of 1,728 miles at 256 m.p.h. Its armament includes a power-operated multi-gun turret on top of the fuselage, a retracting turret beneath and one or more forward-firing guns; its normal crew is five. A distinctive feature is that the mid wings are gulled, the out panels being set at a small anhedral angle. Dimensions: Span 67ft. 6in., length 51ft. 5in., height 14ft. 10¾in., wing area 610 sq. ft.

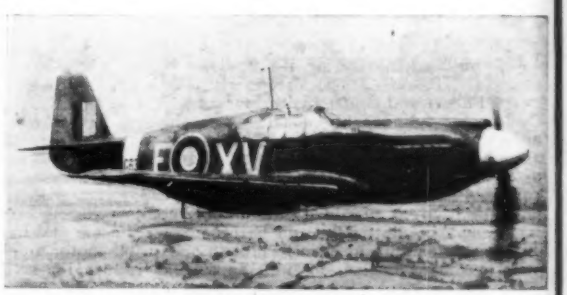


MOHAWK

CURTISS-WRIGHT CORP., U.S.A. Single-seater fighter ordered in large numbers for the R.A.F. early in the war, and even earlier by the French, it was a development of the U.S. Army Air Force P-36A, since superseded. The power plant is a 1,200 h.p. nine-cylinder Wright Cyclone R-1820-G205A engine, which gives it a top speed of 325 m.p.h.; its service ceiling is 32,700ft. Constructed of aluminium alloy, with smooth Alclad skin, the fuselage is of the monocoque type. Undercarriage retracts backwards on the usual Curtiss principle, and the tailwheel is also retractable. Various combinations of fuselage and wing guns were employed; wing racks for light bombs were also provided. Dimensions: Span 37ft. 4in., length 28ft. 10in., height 9ft. 3in., wing area 236 sq. ft.

MUSTANG

NORTH AMERICAN AVIATION, INC. Single-seater fighter in service with the Army Co-operation Command of the R.A.F. and with the U.S. Army Air Force as the P-51; the makers themselves call it the Apache. Powered by a 1,150 h.p. Allison V-1710-F3R liquid-cooled 12-cylinder "V" type engine; top speed about 370 m.p.h. at 15,000ft. High-speed reconnaissance and low-level attack are its chief duties in the R.A.F. All-metal construction, monocoque fuselage carries single radiator below cockpit. Square-cut wing tips and a large angular fin and rudder. Armament comprises 0.5in. and 0.303in. machine guns in the fuselage and wings. Dimensions: Span 37ft., length 32ft. 2in., height 11ft. 8in., wing area 235.75 sq. ft.

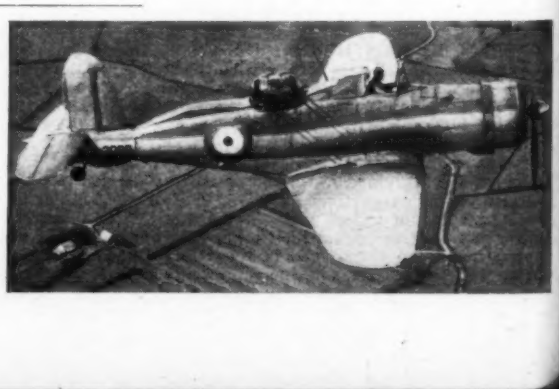


NOMAD

NORTHROP AIRCRAFT INC., U.S.A. Two-seater dive-bomber in service with the Fleet Air Arm, the U.S. Army Air Force as the Northrop A-17A, and the U.S. Navy as the BT-1. Its makers' designation was 8A-3P, and from it was developed the DB-84. Powered by a 1,050 h.p. Pratt and Whitney Twin-Wasp; top speed 260 m.p.h., cruising range about 900 miles. It carries a bomb load of 1,800lb., and its defensive armament consists of four fixed machine guns in the wings, and either one or a pair of free machine guns in the rear cockpit. All-metal, stressed-skin construction. Dimensions: Span 47ft. 10in., length 32ft. 5in., height 9ft. 9in., wing area approximately 362 sq. ft.

ROC

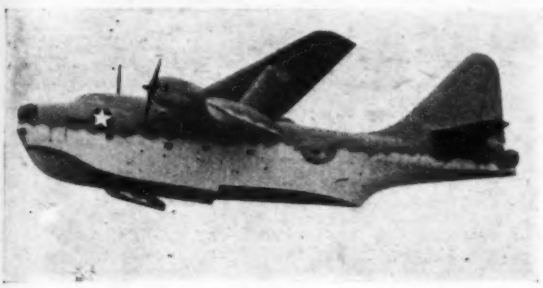
BLACKBURN AIRCRAFT, LTD., Great Britain. Two-seater fighter supplied to the Fleet Air Arm for operation with aircraft carriers. Though not now very much in evidence, the Roc shared with the Defiant the distinction of being the only other single-engined two-seater fighter with a power-operated, four-gun turret. It was produced in both seaplane and landplane versions, the only difference, of course, being the substitution of floats for the wheeled undercarriage, and on the latter the provision of deck arrester-gear. Powered by a 905 h.p. Bristol Perseus XII nine-cylinder, sleeve-valve, air-cooled radial engine; top speed about same as Skua. Dimensions: Span 46ft., length 35ft. 7in., height 12ft. 11in.



AIRCRAFT OF THE ANGLO-AMERICAN FORCES

SEAGULL (OR SEAMEW)

CURTISS-WRIGHT CORP., U.S.A. Two-seater scout-observation monoplane in service with the U.S. Navy (official designation So3C-2) and with the Fleet Air Arm as the Seamew. The same aircraft is also produced for the U.S. Navy only by Ryans, who call it SOR-1 Seagull. Powered by a 520 h.p. 12-cylinder inverted "V" air-cooled Ranger GV-770-6 engine giving it a top speed of 190 m.p.h. at 5,000ft. No other performance figures available. Also supplied with non-retractable wheeled undercarriage for carrier operation. Note sharply upturned wing-tips and large single fin extending over rear cockpit. Dimensions: Span 38ft., length 36ft. 9in., height 11ft. 3in., wing area 290 sq. ft.



SEA RANGER

BOEING AIRCRAFT CO., U.S.A. Twin-engined patrol-bomber designed experimentally for the U.S. Navy; official designation XPBB-1. The largest twin-engined flying boat so far built, the Sea Ranger is to be produced in quantity at a new plant. Very few details have yet been released, but it is powered by a pair of 2,000 h.p. Wright Duplex-Cyclone 18-cylinder air-cooled radial engines. A top speed in excess of 250 m.p.h. may be expected. A wing of very high aspect-ratio is used, with the engines mounted close to the hull. Normal crew is ten, with provision for long cruises away from base; a heavy bomb-load or several torpedoes can be carried. Five gun turrets are provided, nose, tail, dorsal and two blister. Estimated dimensions: Span 140ft., length 86ft.

SKUA

BLACKBURN AIRCRAFT, LTD., Gt. Britain. Two-seater Navy fighter-dive-bomber, produced for the Fleet Air Arm. Substantially the same general construction as the Roc except that it has no gun turret and the wings have no dihedral angle apart from upturned tips. Each has metal stressed-skin monocoque fuselage, folding wings and watertight compartments in fuselage and wings. The Skua is also powered by a Bristol Perseus XII nine-cylinder sleeve-valve air-cooled radial engine of 905 h.p., and its top speed is 225 m.p.h. at 6,500ft. Cruising speed is 187 m.p.h. at 15,000ft., and service ceiling 22,000ft. Armament consists of four fixed forward-firing guns and a single gun in the rear cockpit. Equipped for catapult and carrier operation. Dimensions: Span 46ft. 2in., length 35ft. 7in., height 14ft. 2in., wing area 312 sq. ft.

SPITFIRE

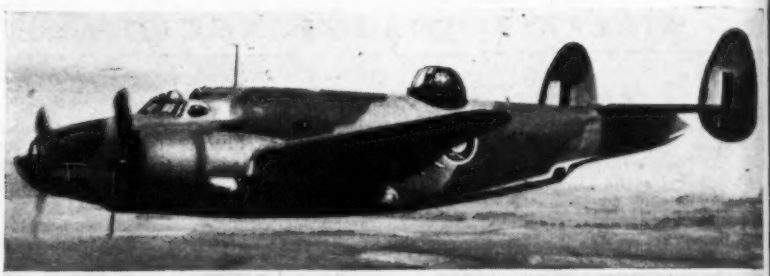
VICKERS-ARMSTRONGS, LTD., Gt. Britain. Single-seater fighter in service with the R.A.F., Fleet Air Arm and a number of U.S. Army Air Force squadrons in Europe. Like the Hurricane, there are quite a number of different versions of the Spitfire, including the tropicalised models and the one adapted for carrier operation with the F.A.A. which is called the Seafire. The latest is the Spitfire IX, which has the Rolls-Royce Merlin LXI driving a four-bladed Rotol c.s. airscrew, and differs in appearance in having a longer nose, two radiators under the wings, and a faired, long-range tank under the centre-section. The cockpit cover and wing plan have also been slightly modified, but no dimensions nor performance figures may yet be published.

STIRLING

SHORT BROS., Gt. Britain. Four-engined long-range heavy bomber in service with the R.A.F. Powered by four 1,600 h.p. Bristol Hercules 14-cylinder sleeve-valve radial engines, or, alternatively, four Wright Cyclone double-row GR-2600 radials of the same power; de Havilland c.s. airscrews are fitted in either case. Defensive armament consists of nose, dorsal and tail power-operated gun-turrets mounting eight 0.303in. machine guns in all. Top speed is, like our other four-engined long-range heavy bombers, about 300 m.p.h., maximum range in excess of 2,000 miles, and maximum bomb-load nearly eight tons. Dimensions: Span 99ft. 11in., length 87ft. 3in., height 22ft. 9in., wing area 1,460 sq. ft.

Ventura Day Bomber

Photographs of One of Bomber Command's Latest Operational Types



The side view of the Lockheed Ventura in the top air photograph shows the deep fuselage and also the upper and lower turrets for tail protection. The Ventura is powered by two 2,000 h.p. Pratt and Whitney Double Wasps with Hamilton Standard hydromatic airscrews. In the front view above the starboard airscrew is fully feathered and is just on the point of stopping. (Below) The bomb train calls and leaves each Ventura a quota of bombs. The offensive armament in the front is two .303in. machine guns fitted in the Perspex nose and two fixed .5in machine guns in the fuselage top.

(Above) The Ventura has shapely lines for a machine with such a big fuselage. In this view can be seen the flap guides and also the permanent wing-tip slots which help to give good control at the stalling speed.

(Left) A line of Venturas, with their engines running, about to taxi out to the take-off point. Similar in many respects to the Lockheed Hudson, which has done such excellent work with Coastal Command, the family resemblance in outline is very strong.

CORRESPONDENCE

The Editor does not hold himself responsible for the views expressed by correspondents. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

FIRST SPITFIRE FLIGHT

Mistaken Impression Corrected

I AM anxious to correct a wrong statement which has been widely circulated in the daily Press.

The initial flight tests of the prototype Spitfire were made by Mr. J. Summers and not (as has been stated) by me.

The first flight took place in March, 1936, and Mr. Summers was then, and still is, Chief Test Pilot to the Vickers Group of companies. The error has no doubt arisen from the fact that Mr. Summers granted to me the privilege of flying the aircraft at its first public appearance in June, 1936, at which Press representatives were present.

I would also like to add that much of the development work on the prototype and later Spitfires was done by Mr. A. G. Pickering, who is still with the Supermarine works.

As the first flight of the first Spitfire was undoubtedly an historic event, I should be glad if you would give due prominence to the above facts.

J. K. QUILL.

BOMBER ESCORT

Long-range Fighters or Longer-range Guns?

I WONDER if I can help Mr. Condon in his problem of fighter escort? I can assure him that the time is not far distant when fighters will be able to escort bombers to the limit of their journey and back, providing it is profitable to do so. One must remember when a fighter is equipped with long range tanks and necessary ammunition and gear it becomes a little slow in handling. Moreover, one has to bear in mind that whilst the bomber may have an operational flight of, say, 1,000 miles, the fighter escorting it would have to have twice that range, if it wanted to have a real "set to" on the return journey.

A given range at a steady 300 m.p.h. is not so expensive as the same range with half a dozen dog fights thrown in; once you start pushing the throttle through the emergency gate your range shortens.

I think the problem is being tackled on the right lines by fitting longer range guns to the bomber. Half a dozen cannon with, say, 300 yards range, are better than 16 machine guns of 200 yards range, because, obviously, a fighter can (as has happened) sit outside the range of the bomber's machine guns and just push holes into it. It is not an easy problem, believe me, to fit cannon to a bomber; they are not easy to fit in a movable turret. The solution lies in longer range, larger calibre machine guns for the bomber rather than fighter escort for extreme journeys.

I would add (without, I think, giving any secrets away) that despite all the talk that we British are far behind in certain types of aircraft, there are many pleasant surprises in store for the public, and without offending any of our allies I think we can say that British aircraft of all types are second to none. In fact, I think British aircraft have led the world, and I honestly believe they will continue to do so.

R. H. CORDERY.

AN UNFORTUNATE CHOICE?

Venturas in the Eindhoven Raid

THE Eindhoven raid is discussed by a correspondent in your issue of December 31st, 1942. It is also mentioned elsewhere in that issue in connection with the Lockheed-Vega Ventura. Twelve bombers were lost in that raid. I feel that a large proportion of them must have been Venturas.

A study of the three types engaged in the operation—Mosquitos, Bostons and Venturas—leads one to the conclusion that the Ventura was an unfortunate choice.

Bostons have already proved their worth in daylight bombing attacks where their high speed and heavy armament ensure a minimum amount of time over enemy territory combined with good defensive as well as offensive powers. The excellence of the Mosquito for high-speed bombing in daylight is now well confirmed.

About a fortnight ago I saw a really magnificent film of the raid in the news at a local cinema. There were some fine shots of Mosquitos and Venturas taking off, and the latter type seemed terribly slow in the air by comparison. Films taken from the nose of one of the Bostons showed the crossing of the Dutch coast, Bostons sweeping over enemy-occupied territory at 0 feet, and the run-up to the target, firing at German gunners on the roof of the factory. Shots from the rear turret showed the bombs bursting on their objective.

Throughout this brief but interesting film I had the impression that the Venturas must have had a tough time if they had sought to emulate the antics of the Bostons. Like its younger brother, the Hudson, it is developed from a spacious airliner, and so is suitable rather for long-range reconnaissance over large stretches of ocean—where comfort for the crew is an important consideration—than for daylight bombing of enemy territory where speed is the dominant factor.

It is no reflection on the design or performance of the Ventura to say that it is not suitable for the type of job which it was called upon to carry out in the Eindhoven raid. This machine should be used in carrying on the traditions of the Hudson in convoy escort and anti-submarine work.

S. W. GREENWOOD.

BOOST PRESSURE VARIATION

Behaviour of the Hercules

IN reply to K. V. P.'s request for confirmation of the "rising boost phenomenon," I am not in a position to write regarding the Merlin but have noted the following average figures during the ground testing of Hercules XI engines.

Upon reducing the engine r.p.m. from 2,400 to 1,800 by coarsening the pitch of the airscrew, the boost *invariably* rises from about -1lb./sq. in. to $-\frac{1}{2}$lb./sq. in.

It should be noted that on this type of engine the lowest datum setting of the boost control is -4lb./sq. in., so there can be no doubt that the boost control is in action during the airscrew check.

Thus it would appear that there is a difference between the pressure operating the boost gauge and that acting on the boost control aneroid. To account for this is the fact that the connections for gauge and control are at different points on the induction system. In the Merlin, and, to a lesser degree, the Hercules, the gauge connection is nearer the cylinder, along the path of the mixture, than is the boost control connection.

Therefore, is it not possible that the back pressure, which increases as the revs drop, is more pronounced on the gauge connection and the uncorrected increase is registered on the gauge?

"FITTER IIE."

Factors Affecting Control

AS "Navy Plumber" states in the December 31st issue of *Flight*, the Merlin XX boost control is inoperative at zero boost, but this is not due simply to the action of the change-over cock; this only substitutes atmospheric pressure for boost when the latter is insufficient to operate the relay.

The pressure at which the b.c. will begin to control is dependent upon several factors, among which are aneroid spring stiffness, initial clearance between tappet and aneroid assembly, length of assembly and the clearances of the piston-valve and relay piston, not forgetting strength of relay piston bias spring.

On many engines I have noticed that the relay piston begins to travel towards the rear outer end of the cylinder when the boost is about $+\frac{1}{4}$ lb./sq. in., hence it can only control at a boost slightly greater than this pressure, or, of course, any higher pressure.

In the October 1st issue of *Flight*, page 356, it was stated that the maximum power altitudes of the Hercules III are 14,500 ft. and 15,000 ft. respectively in m.s. and f.s. gear, the powers being 1,425 and 1,270 b.h.p. Should not the altitude given as 14,500 ft. read 4,500 ft., or some similar figure?

Another rather interesting and similar question to that raised by "Puzzled" arises in the case of the Merlin X. When running at rated boost in m.s. a slight increase in boost is obtained when gear change to f.s. is effected.

This increase is more pronounced with engines which are fitted with partially worn boost controls. Although the control may be adjusted to control at $5\frac{3}{4}$ lb./sq. in. in m.s., an increase to 6 lb./sq in. may result when f.s. is engaged.

My explanation is that, due to the greater pressure difference across the blower in f.s., leakage losses in the control increase

CORRESPONDENCE

and the pressure in the aneroid chamber may be (say) 5½ lb./sq. in., hence the assembly extends and correction results in the actual boost rising to a figure above 5¾ lb./sq. in.

Is this the answer, or is this increase in boost due to the lower charge velocity in the induction pipe (due to drop in r.p.m. of the engine) when f.s. is engaged? Perhaps some other reader could answer my question. C. W. JACKSON.

Primarily a Matter of R.P.M.

WITH reference to the elusive increase of boost pressure experienced by your correspondent "Puzzled," as the r.p.m. of a Merlin are reduced, I feel that there is a reasonably simple explanation. Mr. Greenland has explained a phenomenon associated with butterfly torque and boost control action which is irrelevant to the case in point. No doubt there is some increase due to the cause he quotes, but this is so small in practice as to be unreadable on a boost gauge. It certainly does not amount to the ¾ lb./sq. in. stated by your previous correspondent.

The question can only arise when the boost control is selecting a higher boost than the engine is receiving, i.e., the control is out of operation and the butterflies are fixed at a definite angle. The pressure drop across the butterflies is proportional to the square of the mixture flow and the latter is proportional to the engine r.p.m.

i.e., $P_D = K(R.P.M.)^2$.

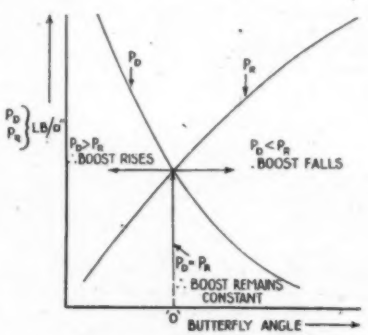
If the r.p.m. are reduced the same formula holds good but the value of K will alter, due to variations in supercharger efficiency at various r.p.m. However, over a limited r.p.m., we may assume a sensibly constant value of K.

Similarly the pressure rise across the supercharger is proportional to $(R.P.M.)^2$, i.e.,

$P_R = K_1 (R.P.M.)^2$. Thus by reducing the r.p.m. in this small range both the pressure drop across the butterflies and the pressure rise across the supercharger are reduced in the same *ratio*, i.e., by $\left(\frac{\text{new R.P.M.}}{\text{original R.P.M.}}\right)^2$

If, therefore, the pressure rise across the supercharger were less than the pressure drop across the butterflies at the original r.p.m., a rise in boost pressure will be experienced. To illustrate this contention, take an engine running at 1,500 r.p.m. with boost control locked out of operation (as it is with most modern carburettors at low throttle lever openings). Air intake pressure 14.7 lb./sq. in.; pressure drop over butterflies 8 lb./sq. in.; therefore supercharger intake pressure 6.7 lb./sq. in.; supercharger pressure rise 6 lb./sq. in.; induction pressure therefore 12.7 lb./sq. in., which is −2 lb./sq. in. boost. Now reduce the r.p.m. to 1,200 by coarsening the airscrew blades. The pressure drop (P_D) and the pressure rise (P_R) are reduced by $\frac{1,200^2}{1,500}$, i.e., by 0.64. The drop becomes $0.64 \times 8 = 5.1$ lb./sq. in. and the rise $0.64 \times 6 = 3.85$ lb./sq. in. Thus the induction pressure is $14.7 - 5.1 + 3.85 = 13.45$, i.e., a boost of $-1\frac{1}{4}$ lb./sq. in.—a rise of ¾ lb./sq. in.

The accompanying rough curve of P_D and P_R against butterfly angle will explain the phenomenon.



The curve shows that if $P_D > P_R$, i.e., at butterfly angles below point "O," the boost will rise as demonstrated by the above example. At point "O" the boost will remain constant, whilst above point "O" the boost will fall.

When there is no pressure rise across the supercharger (a naturally aspirated engine) the effect of r.p.m. reduction is obviously more marked and the induction pressure always rises with a lowering of r.p.m. Those readers fortunate enough to run motor cars might care to fit an induction pipe pressure gauge, lock the hand throttle and drive over an undulating road. The variations of pressure with r.p.m. will be most noticeable.

JOHN Y. TOMLINSON.

GROUND STAFF GRADING

Slow Progress in the F.A.A.

SOMEONE recently deplored the fact that progressive efficiency in the ranks of R.A.F. ground crews tends towards organisation and away from technical work. May I point out that this is not so much the case with the R.A.F. as with the F.A.A.?

If an A/C.2 flight mechanic is efficient and capable he can become an A/C.1 or even an L.A/C. immediately after his technical training course. On the other hand, an A.M.2 (air mechanic) who is trained with the R.A.F. flight mechanic and passes exactly the same board *must* wait at least fifteen months before he can become an A.M.1, no matter how brilliant he may be.

It cannot be said that his rank is higher than an A/C.1, for he is paid less, even though he often works on exactly the same work with an A/C.1. To become an L.A.M. he must wait at least a further eighteen months.

In the R.A.F. a clever flight mechanic can be converted to fitter II in a very short time. I know scores of corporal fitter IIs who have served only eighteen months in the R.A.F.

In the F.A.A. rules and regulations prevent an air mechanic from ever becoming a fitter. He must remain an air mechanic throughout his career.

An A.M.2 of my acquaintance holds a G.E. licence (X) for magnetos, but after twelve months' service he is still an A.M.2—but, he is doing a fitter's work on magnetos. It is only rules and regulations that prevent him becoming a fitter.

Does the Admiralty consider this trade grouping more remunerative than the R.A.F. method whereby a man can improve his trade group? "AIR MECHANIC."

POST-WAR AIR-MINDEDNESS

Provision for the Private Pilot

IN the last few months we have heard much about the great advances made in aviation and of the great plans which are open to us in the future. Most of this talk is concerned with the commercial side of aviation, and has been expressed mainly in terms of trans-oceanic flying-boats. At the same time, however, many of these spokesmen emphasise the need to create and maintain a state of air-mindedness in the ordinary individual if aviation is to take a foremost position. That need is certainly vital, and there therefore remains the question of how it is to be best satisfied.

Some would say that the nation is at present highly air-minded. But is it really so very much so? Many people see and read about aircraft almost every day, but even yet they do not know a great deal about them. The tremendous growth of the R.A.F. has given a large number of young men an intimate knowledge of aircraft, but apart from them there are many citizens who have only the vaguest notions of an aircraft's construction and how it is controlled in the air. Consequently, what seems to be required is a closer contact with aircraft, and that can be made most suitably through the medium of sporting flying.

Unfortunately this branch of flying has been neglected, even before the war. True, at the outbreak of war quite a few promising light aircraft were appearing, but little, if any, of the technical advancement we have seen in the last few years will affect sporting flying to a worth-while degree. The powerful engines and increasing complexity of modern types will play no part in popularising a small aircraft where cheap flying costs and safety would seem to be prime factors.

Is it not time, then, that we gave this position a thought? We cannot, of course, start building such types now, but it would be wise to make certain that when peace does come we are ready with the plans for developing this section of flying in the best possible manner.

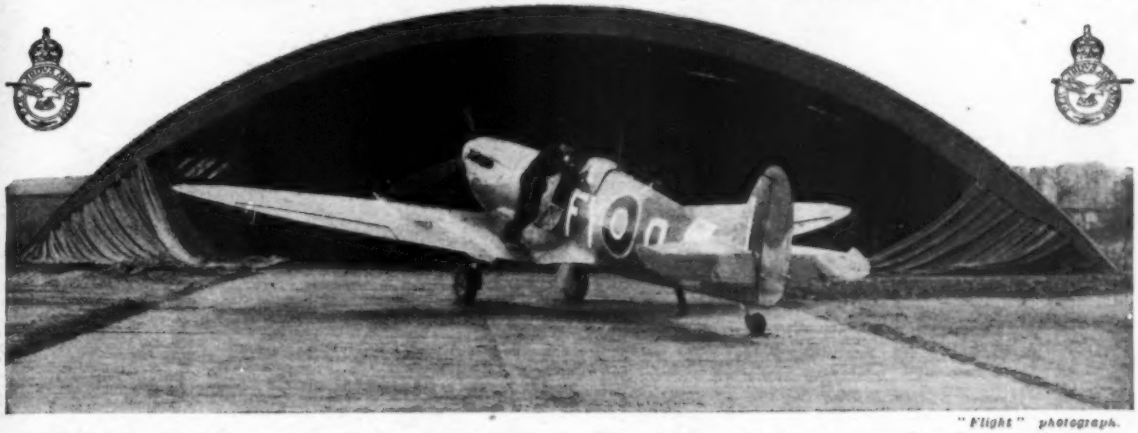
Now that we have so many fine airfields it would be simple to extend light aircraft flying all over the country—provided that it is brought within the scope of the average man or woman. It definitely was not before 1939 (with the exception of the Civil Air Guard).

In contrast to America, where light aircraft had really "got somewhere," we had allowed private flying to be looked upon as within the reach of nobility only—as indeed it was to a large extent. All that can end if we go about it in the right manner. We must, however, see that this flying is, above all else, both cheap and safe.

As long as these essentials are kept in mind and we do not endeavour to bring high performance into the picture, I am sure development would proceed along smooth lines.

"MOTH."

SERVICE AVIATION



"Flight" photograph.

Servicing a Spitfire IX on the apron of a "blister" hangar. These hangars are easy to camouflage because they cast practically no shadow.

Royal Air Force and Fleet Air Arm News and Announcements

Promotions

The London Gazette, January 8th, 1943.

GENERAL DUTIES BRANCH.

Air Commodores. (Act. Air Vice-Marshals) to be Air Vice-Marshals (temp.), December 1st, 1942.
D. HARRIES, C.B., A.F.C.
R. D. OXLAND, C.B.E.
A. J. CAPEL, C.B., D.S.O., D.F.C.
A. LEES, O.B.E., D.S.O., A.F.C.
D. E. BAKER, D.S.O., M.C., A.F.C.
J. B. COLE-HAMILTON, C.B.E.
C. R. CARR, C.B.E., D.F.C., A.F.C.
D. COLYER, C.B., D.F.C.
A. DURSTON, C.B., A.F.C.
H. E. P. WIGGLESWORTH, C.B.E., D.S.C.
H. W. L. SAUNDERS, C.B.E., M.C., D.F.C., M.M.
L. N. HOLLINGHURST, C.B., O.B.E., D.F.C.
R. P. M. WHITHAM, C.B., O.B.E., M.C.
R. S. SORLEY, C.B., O.B.E., D.S.C., D.F.C.
SIR HUGH P. LLOYD, K.B.E., C.B., M.C., D.F.C.

Air Comdre. L. H. SLATTER, K.B.E., C.B., D.S.C., D.F.C., to be Act. Air Vice-Marshal, March 10th, 1942, and Air Vice-Marshal (temp.), December 1st, 1942.

TECHNICAL BRANCH.

Air Comdres. (Act. Air Vice-Marshals) to be Air Vice-Marshals (temp.), December 1st, 1942.
H. H. MCL. FRASER.
V. H. TAIT, O.B.E.

EQUIPMENT BRANCH.

Air Comdre. (Act. Air Vice-Marshal) W. B. CUSHION, C.B.E., to be Air Vice-Marshal (temp.), December 1st, 1942.

MEDICAL BRANCH.

Air Comdres. to be Act. Air Vice-Marshals, May 25th, 1942, and Air Vice-Marshals (temp.), December 1st, 1942.
F. C. COWTAN, M.R.C.S., L.R.C.P., K.H.S.
A. E. PANTER, M.R.C.S., L.R.C.P., K.H.S.

Air Comdre. A. GRANT, C.B.E., M.B., Ch.B., D.P.H., to be Act. Air Vice-Marshal, June 17th, 1942, and Air Vice-Marshal (temp.), December 1st, 1942.

Grp. Capts. to be Air Comdre. (temp.), January 1st, 1943.
E. H. KNOWLES, M.B., Ch.B., D.P.H.
K. BRIGGS, M.C., M.R.C.S., L.R.C.P., D.P.H.
R. W. RYAN, M.B., B.S.

Awards

THE KING has been graciously pleased to approve the following awards in recognition of distinguished services:—

O.B.E. (MIL.)

Sqn. Ldr. E. A. HOWELL, D.F.C.

MILITARY CROSS

Flt. Lt. R. A. LENTON.

MILITARY MEDAL

W/O. F. W. RIXON.
Sgt. E. R. CERELY.

THE KING has been graciously pleased to approve the following awards in recognition of gallantry displayed in flying operations against the enemy:—

DISTINGUISHED SERVICE ORDER

Flt. Lt. L. A. VAUGHAN, D.F.C., R.A.F.V.R., No. 40 Sqn. (since deceased)—This officer has completed a large number of operational missions, including sorties over Germany and enemy territory and in the Middle East. During a recent period of intense aerial activity his fine fighting qualities and courageous example have been worthy of the highest praise.

Act. Wing Cdr. R. M. DUKE-WOOLLEY, D.F.C. By his outstanding leadership and untiring efforts, Wing Cdr. Duke-Woolley has contributed much to the successes attained by his wing. Since June, 1942, he has led his formation in many raids over enemy-occupied territory, in the course of which 28 enemy aircraft were destroyed. Wing Cdr. Duke Woolley has completed successfully a large number of operational sorties and has displayed outstanding qualities of airmanship and tactical skill. He has destroyed at least ten enemy aircraft.

BAR TO DISTINGUISHED FLYING CROSS

Sqn. Ldr. R. MARPLES, D.F.C., No. 238 Sqn.—In November, 1942, this officer participated in intensive attacks on the enemy's transports and supply lines. During the period, his squadron destroyed 50 and disabled 90 more transports and three aircraft.

Act. Flt. Lt. D. W. SCHMIDT, D.F.C., R.C.A.F., No. 227 Sqn.—Since being awarded the D.F.C., this officer has completed many sorties. In an engagement in November, 1942, he destroyed two Ju. 52's and assisted in the destruction of a Do 24. His aircraft was hit in some 50 places by return fire and the port engine set alight, but he succeeded in extinguishing the flames and flew the damaged aircraft to base, landing it safely in difficult circumstances. Some days later, he shot down a Ju. 52, and shortly afterwards he destroyed a C.R. 42. In attacks on enemy shipping, Flt. Lt. Schmidt has achieved notable success.

P/O. H. W. DONKERSLEY, D.F.C., R.C.A.F., No. 69 Sqn.—In sorties against enemy shipping, this officer has achieved much success. One night in November, 1942, he captained an aircraft detailed to drop flares over Italian naval units, and accomplished his task successfully. Several nights later he attacked and sank a small merchant vessel. On another night, in December, 1942, he participated in an operation against an important enemy convoy in the Mediterranean. As a result, other air and surface forces were enabled to strike successfully; two merchant vessels were sunk and one badly damaged.

DISTINGUISHED FLYING CROSS.

Wing Cdr. E. L. A. WALTER, A.F.C., No. 113 Sqn. During the past three months Wing Cdr. Walter has taken part in many operational sorties. In November, 1942, he led an attack from a low level against enemy shipping off Akyab. In the face of strong opposition from anti-aircraft defences and enemy fighters, direct hits were obtained on two enemy vessels.

F/O. R. H. BERTRAM, R.C.A.F., No. 38 Sqn.—In October, 1942, this officer was the pilot of one of a formation of aircraft detailed to make a daylight attack on an enemy ship in Tobruk harbour. Displaying great skill and determination he made a successful attack, scoring at least one hit on the target. His determined attack contributed much to the combined effort of the operation which achieved the destruction of the vessel.

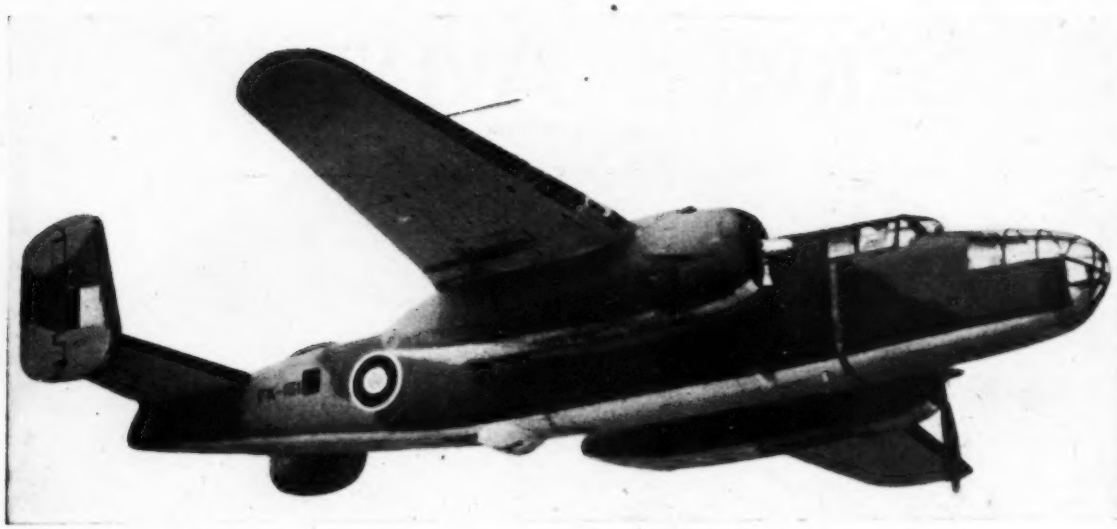
F/O. J. S. R. MULLER-ROWLAND, R.A.F.V.R., No. 60 Sqn.—F/O. Muller-Rowland has made many reconnaissances deep into Burma and brought back information of great value. On two occasions recently he participated in low-level attacks against enemy shipping off Akyab. Despite strong opposition from air and ground defences this officer pressed home his attack with great determination.

P/O. P. EASTCOTT, R.C.A.F., No. 221 Sqn.—In October, 1942, P/O. Eastcott was navigator in an aircraft which led a formation detailed to make a daylight attack on an enemy ship in Tobruk harbour. The outward flight, a distance of several hundred miles over the sea, was made only a few feet above the water, and complete surprise was achieved. At least three hits were scored on the vessel, which was destroyed.

Sqn. Ldr. J. E. S. MORTON, No. 40 Sqn.—This officer has taken part in many sorties in the Mediterranean area, including attacks on Sicily, Bizerta and Tunis; he has also participated in sorties over Germany. In November, 1942, in a raid on Bizerta docks, Sqn. Ldr. Morton had to attack from an extremely low level owing to thick cloud over the target area. In spite of heavy opposing fire he pressed home his mission and all his bombs fell on important objectives. In December, 1942, he successfully bombed a merchant ship.

Sqn. Ldr. P. OLVER, R.A.F.V.R., No. 213 Sqn.—Sqn. Ldr. Olver has flown with great distinction on recent sorties during which fierce attacks have been made on aircraft and transport well behind the enemy's lines. In November, 1942, when his

Air Chief Marshal Sir Charles Portal leaving an investiture held by King Haakon of Norway. Sir Charles was decorated with the Grand Cross of the Order of St. Olaf.



The North American Mitchell is giving good service in the Middle East. It carries a crew of five and a bomb load of 2,000 lb. Maximum speed is officially given as exceeding 300 m.p.h. This view shows the under-turret protecting the tail.

SERVICE AVIATION

squadron attacked an airfield at Agedabia, six enemy aircraft were destroyed; three of these were destroyed by Sqn. Ldr. Olver. Although one of the fuel tanks in his aircraft caught fire and exploded, he led his squadron back to a landing ground. In spite of many difficulties and adverse weather he kept his formation together and so enabled further operations to be undertaken on subsequent days.

Act. Flt. Lt. J. C. BRIDGER, R.A.F.V.R., No. 161 Sqn.—This officer is a highly skilled pilot whose determination to complete his mission, however hazardous, has won great admiration. He has undertaken many sorties, all of which were successful, and has frequently flown his aircraft to base after it has been damaged by enemy action.

Act. Flt. Lt. O. C. KALLIO, R.C.A.F., No. 53 Sqn.—In October, 1942, this officer led a formation against a force of enemy dive-bombers protected by a strong escort of fighters. The attack was so skilfully executed that the enemy bombers were compelled to jettison their bombs on their own lines. A few days later, in a similar sortie, a superior formation of enemy bombers was forced to release its bombs prematurely. Throughout the engagement Flt. Lt. Kallio, who destroyed a Ju 87, displayed fine leadership.

Pantellaria Attacks

P/O. T. St. B. FREER, R.A.F.V.R., No. 227 Sqn.—In attacks on enemy shipping this officer has displayed high skill and courage. In October, 1942, he participated in an attack on an armed motor vessel escorted by a destroyer. In spite of heavy opposing fire, P/O. Freer pressed home his attack. His aircraft sustained much damage, but he flew it back to base. In November, 1942, he bombed a motor vessel off Pantellaria. Some days later, in the same area, he obtained hits with his bombs on another vessel. In this attack, which was executed in face of heavy fire from the shore defences, P/O. Freer flew so low that one of his propellers touched the ship's funnel.

F/O. H. TILSON, R.C.A.F., No. 15 Sqn.—As captain of aircraft, F/O. Tilson has taken part in many sorties. Whatever the odds, he has always endeavoured to press home his attacks with determination. In November, 1942, he participated in an attack on Genoa, securing a photograph of the target. Some days later, he took part in a successful raid on Turin.

Sqn. Ldr. K. H. SALUSBURY-HUGHES, R.A.F.V.R., No. 23 Sqn.—This officer has completed many sorties, involving attacks on factories, marshalling yards and enemy airfields. Sqn. Ldr. Salusbury-Hughes has destroyed three enemy aircraft.

Flt. Lt. N. P. W. HANCOCK, No. 250 Sqn.—In November, 1942, this officer led the squadron some 200 miles in bad weather to intercept an enemy air transport convoy. The formation arrived at precisely the right time and, in the ensuing engagement seven of the transports were shot down and five were destroyed on the ground. Flt. Lt. Hancock, whose leadership was outstanding, shot down a He 111 and destroyed three aircraft on the ground. On another occasion he participated in an attack on German E-boats which were operating against a harbour in our hands. During the engagement four E-boats were sunk, one of them by Flt. Lt. Hancock. This officer, who formerly fought in France and in the Battle of Britain, has always displayed great skill and determination.

Act. Flt. Lt. L. W. H WELCH, R.A.F.V.R., No. 23 Sqn.—

F/O. W. R. SHUTTLEWORTH, R.A.F.V.R., No. 23 Sqn.—In December, 1942, Flt. Lt. Welch and F/O. Shuttleworth, as pilot and navigator of aircraft respectively, undertook a sortie into enemy territory. Despite adverse weather, success was achieved. At least two enemy aircraft were destroyed. The skilful execution of the operation reflects great credit on the efforts of these two officers. Both Flt. Lt. Welch and F/O. Shuttleworth have completed numerous sorties over enemy territory.

Act. Flt. Lt. D. C. BEATON, R.A.A.F., No. 459 Sqn.—This officer has displayed exceptional courage and initiative. One morning in September, 1942, he attacked an enemy destroyer near the North African coast. Despite intense opposing fire, he pressed home his attack, obtaining hits which caused a large explosion followed by a fire. In air combat, Flt. Lt Beaton has destroyed two enemy aircraft.

P/O. N. J LEWIS, R.A.F.V.R., No. 227 Sqn.—As navigator, this officer has taken part in several sorties. On a recent occasion he participated in an engagement against a convoy of enemy transport aircraft escorted by fighters. During the combat, his pilot was severely wounded. On the return flight, P/O. Lewis attended to his wounded comrade, who almost fainted several times through loss of blood. P/O. Lewis also rendered valuable assistance in flying the aircraft back to base, where a safe landing was made in darkness.

DISTINGUISHED FLYING MEDAL

Flt. Sgt. A. B. CAMPBELL, No. 227 Sqn.—This officer is a skilful and courageous navigator who has taken part in many sorties. In November, 1942, he navigated one of a formation of aircraft which shot down two Ju. 52's and a Do. 24. Two days later he participated in an attack on an enemy motor vessel. Towards the end of the month, Flt. Sgt. Campbell participated in attacks on enemy shipping with excellent results.

Flt. Sgt. J. B. SNELL, A.A.F., No. 277 Sqn.—In air-sea rescue operations, this airman has participated in many searches in all kinds of weather and has assisted in saving a number of members of aircraft crews. On one occasion in February, 1942, he was the wireless operator of an aircraft which directed boats to a Hampden crew in the sea off St Catherine's Point. Four members of the bomber's crew were picked up.

Sgt. G. W. WILLIAMS, No. 272 Sqn.—In August, 1942, this airman was the navigator of an aircraft which was intercepted by an enemy fighter. During the combat, Sgt. Williams directed his pilot's evasive action and in addition manned a machine-gun. Both he and his pilot were wounded, while the aircraft was damaged and the rear part set on fire. Ignoring his own injuries, Sgt. Williams first tended his wounded comrade and then went to the rear of the aircraft to fight the flames. Smoke filled the fuselage and Verey cartridges were exploding, but, using his parachute harness, he successfully beat out the flames. Sgt. Williams then returned to the pilot, and after dressing his wounds, gave him all assistance possible until a safe landing was made at base.

Flt. Sgt. W. PHILLIPS, No. 214 Sqn.—As an air gunner, this airman has been engaged on operational flying since December, 1939. In April, 1940, his aircraft was one of a formation which was attacked over Stavanger by some forty enemy aircraft. In the ensuing engagement Flt. Sgt. Phillips acquitted himself with skill. On another occasion in June, 1940, during a return flight from Western Germany his aircraft was caught in a concentration of searchlights and subjected to heavy fire. Displaying great coolness and accuracy of fire, Flt. Sgt. Phillips succeeded in extinguishing many of the searchlights and greatly assisted his pilot in evading the defences.

Flt. Sgt. P. R. POUNDS, No. 460 (R.A.A.F.) Sqn.—This airman served in France in the early days of the war and later he took part in the Battle of Britain. He is a courageous and skilful wireless operator/air gunner whose devotion to duty has been outstanding.

Flt. Sgt. J. B. ROBINSON.—This airman has completed many sorties and has acted as captain of aircraft on numerous occasions. He has never failed to reach the target and has always shown grim determination to complete his task successfully. Most of his sorties have been against heavily defended areas, including Duisburg, Kiel, Berlin, Bremen, Hamburg and Cologne.

Flt. Sgt. J. A. SHARP, R.A.F.V.R., No. 214 Sqn.—This airman is employed as wireless operator/air gunner. He is extremely efficient and has never failed to rectify any wireless failure. His thorough knowledge and efficiency have made his services most valuable.

Flt. Sgt. T. A. STEWART, R.N.Z.A.F., No. 61 Sqn.—Flt. Sgt. Stewart has set an outstanding example of courage and determination to all other air crews. He has participated in attacks on most of the main targets in Germany and occupied territory, and has always displayed exceptional qualities as a captain of aircraft.

Flt. Sgt. W. R. STREET, No. 218 Sqn.—Flt. Sgt.

Lt. Col. Elliott Roosevelt, D.F.C., son of President Roosevelt, prepares his camera for a photographic reconnaissance.

Street has taken part in many operational sorties. Throughout he has proved to be a determined, courageous and outstanding wireless operator who has always shown great devotion to duty.

Flt. Sgt. A. W. SUMMERS, R.A.F.V.R., No. 102 Sqn.—Flt. Sgt. Summers is an air gunner of outstanding ability. On one sortie he was wounded but, after recovering from his wound, he resumed operational flying immediately.

Flt. Sgt. S. TAGG, No. 419 (R.C.A.F.) Sqn.—As wireless operator/air gunner this airman has been engaged on operational flying since November, 1940. His numerous sorties include targets at Berlin, Kiel, Rostock, Cologne and Essen.

Flt. Sgt. (now P/O.) N. F. TURNER, R.A.F.V.R., No. 61 Sqn.—Flt. Sgt. Turner has taken part in attacks against many of the main targets in German and occupied territory, and has consistently obtained excellent photographs. One night in October, 1942, during an attack in bad weather on a target in Northern Germany, his crew secured an exceptionally fine photograph.

Ju 88 Shot Down

Flt. Sgt. N. C. TURNOUR, R.C.A.F., No. 408 (R.C.A.F.) Sqn.—Flt. Sgt. Turnour has taken part in attacks on most of the principal targets in Germany and German-occupied territory, and has also participated in many successful mine-laying operations. One night in August, 1942, he was a member of the crew of an aircraft detailed to attack Kassel. On the outward journey the aircraft was attacked by a Ju 88. After a hard battle the enemy aircraft was shot down and Flt. Sgt. Turnour navigated his aircraft to the target, which was bombed successfully.

Flt. Sgt. H. A. WARD, No. 161 Sqn.—Flt. Sgt. Ward is a most accurate and reliable navigator, who has taken part in many operational sorties. His enthusiasm and devotion to duty has set a high example to all.

Flt. Sgt. G. WATSON, No. 149 Sqn.—This airman has acted as captain of aircraft on numerous occasions. His sorties have been completed in a thorough and determined manner. He has brought back many successful photographs which were obtained when bombing his targets, often in the face of severe opposition. He has taken part in attacks on Rostock, Essen, Hamburg, Saarbrucken and Bremen.

Flt. Sgt. G. A. WITHERICK, No. 405 (R.C.A.F.) Sqn.—This air gunner completed many sorties in the Middle East before joining his present squadron. Vigilant, courageous and reliable, he brings to his task that quick appreciation and decision which make the ideal gunner. Since May, 1942, he has taken part in numerous attacks on enemy targets, including Cologne, Bremen, Duisburg, Hamburg and Essen.

Sgt. J. B. AITKEN, No. 61 Sqn.—In the role of air gunner Sgt. Aitken has participated in many operational sorties, and has always displayed courage, enthusiasm and skill. He has frequently taken part in machine-gun attacks, and was member of a crew which destroyed a U-boat.

Sgt. F. J. J. CHAMPION, No. 420 (R.C.A.F.) Sqn.—This airman is employed as wireless operator/air gunner. He has participated in numerous sorties, including attacks on heavily defended targets as well as several mine-laying operations.

Sgt. H. J. R. COOMBES, No. 61 Sqn.—Sgt. Coombes has served as wireless operator/air gunner. He has participated in attacks against the majority of the most heavily defended targets in Germany, including the daylight raid on Danzig.

Sgt. R. W. COOK, No. 207 Sqn.—Sgt. Cook has taken part in many operational sorties against heavily defended targets in Germany and enemy occupied country. He has performed the duties of wireless operator/air gunner with a high sense of devotion, and his skill has, on several occasions, materially assisted in the safe return of his aircraft.

Sgt. P. CURTIS, No. 15 Sqn.—This airman is employed as flight engineer. He has taken part in attacks on the enemy's shipbuilding yards and docks and on other industrial targets. On several occasions, when his aircraft has been damaged by enemy fire, his sound knowledge of the manipulation of engine controls has enabled the aircraft to be flown safely to base.

Sgt. J. DAVIDSON, No. 78 Sqn.—As rear gunner, this airman has taken part in numerous sorties, including several against Bremen. Early in his operational career he was involved in a bad crash, but this in no way diminished his enthusiasm. In fact, on his next sortie he destroyed a He 113 in air combat over Brest.

Sgt. R. S. ELSOM, No. 218 Sqn. (since deceased).—Sgt. Elsom is a most tenacious and level-headed pilot. In July, 1942, his aircraft was caught in a cone of searchlights and subjected to heavy fire from the ground defences. Despite extensive damage caused to the bomber's tail-plane he flew it safely back. In August, 1942, he was detailed for mine-laying operations, and, although he ran into a magnetic storm, he successfully laid his mines. Again in September, 1942, his aircraft was hit and seriously damaged while over the French coast. Completely unruffled, Sgt. Elsom proceeded to his objective, and, successfully evading strong ground defences on the return journey, flew his battered aircraft home.

Sgt. (now P/O.) J. E. GALLOWAY, No. 408 (R.C.A.F.) Sqn.—Sgt. Galloway has taken part in attacks on Rostock, Cologne, Kiel, Mannheim, Bremen, Duisberg and Saarbrucken. He has also been engaged on many mine-laying operations. He is one of the outstanding wireless operator/air gunners in his squadron, and has always performed his duties with conspicuous skill.

Sgt. W. E. HAMILTON, No. 405 (R.C.A.F.) Sqn.—This airman has performed excellent work as wireless operator. Sgt. Hamilton has taken part in attacks against many well-defended targets, including Essen, Hamburg, Bremen, Dusseldorf and Duisburg.

Sgt. N. J. N. HOCKADAY, No. 75 (N.Z.) Sqn.—As captain of aircraft, this airman has completed numerous sorties, mostly against heavily defended targets. His determination to achieve success, whatever the opposition, has been exceptional. One night in June, 1942, on the outward flight to Bremen, a Ju 88 was observed slightly ahead. Sgt. Hockaday immediately manœuvred his aircraft into a favourable position for his rear gunner to open fire with devastating effect.

Sgt. A. HUDDLESTONE, No. 102 Sqn.—Sgt. Huddlestone completed a number of sorties in the role of air gunner and others as air bomber. Undeterred by enemy opposition, he has always sought his correct target before releasing his bombs. He has taken part in attacks on such targets as Berlin, Kiel, Brest, Mannheim, Dusseldorf, Essen and other important centres.

Sgt. G. S. JEVONS, No. 460 (R.A.A.F.) Sqn.—As wireless operator this airman has displayed a high standard of technical ability. He has participated in numerous sorties, displaying skill and team work which have contributed materially to the successes obtained.

Sgt. A. E. F. S. JONES, R.A.A.F., No. 460 Sqn.—Sgt. Jones is a skilful and keen wireless operator/air gunner. He has participated in many sorties, including attacks on such targets as Le Havre, Cologne, Essen, Bremen, Duisburg and Wilhelmshaven.

Raids and Minelaying

Sgt. D. S. LEECH, No. 408 (R.C.A.F.) Sqn.—Sgt. Leech has displayed a keen and fine fighting spirit. Serving as a wireless operator/air gunner, he has taken part in attacks against Wilhelmshaven, Hamburg, Essen, Cologne, and other heavily defended areas in enemy territory. He has also flown in mine-laying operations.

Sgt. F. G. LOFTS, No. 460 (R.A.A.F.) Sqn.—As wireless operator/air-gunner this airman has participated in numerous sorties, and his excellent work has contributed materially to the successes achieved.

Sgt. J. MACKAY, No. 420 (R.C.A.F.) Sqn.—As wireless operator/air-gunner, this airman has performed his duties in a steady and reliable manner. His skill has inspired confidence, and has contributed materially to the many successes obtained. Sgt. Mackay has participated in bombing attacks on such targets as Emden, Lubeck, Osnabruck and Bremen, as well as in many mine laying operations.

AIR FORCE CROSS.

Wing Cdr. B. V ROBINSON, D.S.O., D.F.C.

Roll of Honour

Casualty Communiqué No. 191.

THE Air Ministry regrets to announce the following casualties on various dates. The next of kin have been informed. Casualties "in action" are those flying operations against the enemy, "on active service" includes ground casualties due to enemy action, non-operational flying casualties, fatal accidents and natural deaths.

Royal Air Force

KILLED IN ACTION.—F/Sgt. L. Banikhin; P/O. H. A. C. R. Cameron Rose; Sgt. A. J. Coombes; Sgt. A. W. Corker; Sgt. H. J. Hart; Sgt. S. Herney; Sgt. R. S. Manktelow; P/O. E. D. Neal; Sgt. G. S. A. Thomson; Sgt. J. D. Vinall; P/O. J. O. B. Wraith; P/O. J. J. Wright.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Sgt. R. Davison; Sgt. D. H. Fletcher; Act. P/O. W. L. Long; P/O. H. B. Mocrehouse; Sgt. D. R. Neve; Sgt. J. J. O'Reilly; Sgt. H. L. Smith; Sgt. T. P. Smith; P/O. J. D. Tew; Sgt. D. S. B. Vincent; P/O. A. C. White.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—F/Sgt. T. L. Lyons; Sgt. T. H. Marlow; Sgt. G. A. R. Mulloy.

WOUNDED OR INJURED IN ACTION.—Sgt. H. R. Battrick; Sgt. T. Campbell; Sgt. G. Garside; Sgt. L. M. Stone; Sgt. A. E. Surridge; Sgt. C. C. Wright.

DIED OF WOUND OR INJURIES RECEIVED IN ACTION.—P/O. E. V. Chandler; Flt. Sgt. E. F. R. Keeper; Sgt. J. B. Redhead; P/O. S. Whitfield.

MISSING, BELIEVED KILLED IN ACTION.—Sgt. R. C. Garnier; Sgt. W. G. Thomas.

MISSING.—Flt. Lt. L. R. Barr, D.F.C.; Sgt. J. N. Bourne, Sgt. A. R. Bowhill; Sgt. A. W. Butteriss; Flt. Sgt. J. E. Corrie; Sgt. J. Cutle; Sgt. F. J. Dacey; Sgt. E. Edmund; Sgt. J. J. Ehler; F/O. R. F. Elliott; Sgt. A. Fairless; Sgt. J. Garduer; Flt. Sgt. C. D. A. Gartside; Sgt. J. Greenwood; Sgt. R. A. W. Hacker; Sgt. J. T. Harkin; Sgt. A. R. Hendrie; Sgt. F. W. N. Hill; Sgt. G. Hodge; F/O. J. W. B. Horne; Sqn. Ldr. J. G. L. Knowles; Flt. Sgt. C. H. R. Leyshon; Sgt. E. A. Linforth; Sgt. R. H. Macintyre; Flt. Sgt. R. G. D. Mathews; Sgt. R. Morgan; Flt. Sgt. L. H. Mutter; Sgt. T. E. O'Connell; Sgt. S. H. Parker; Sgt. A. Parsons; Sgt. M. S. Pepper; Sgt. S. Posner; Sgt. A. S. H. Powell; Sgt. P. B. P. Price; Sgt. M. H. Rawlins; P/O. E. K. M. Runnacles; Sgt. R. S. L. Ryder; Sgt. J. D. Sargeant; Sgt. N. Sephton; Sgt. C. D. Shepherd; Sgt. L. R. Sheward; Flt. Sgt. R. A. Stevenson; Act. Sqn. Ldr. L. A. Stewart, D.F.C.; Sgt. J. Thorpe; Sgt. J. Tunnacliffe; Sgt. K. A. Waite; Sgt. C. H. Williams; P/O. R. E. Williams; Sgt. H. Wolfenden.

MISSING, BELIEVED KILLED ON ACTIVE SERVICE.—Sgt. S. D. J. Curnock; P/O. P. R. Dean; Sgt. G. Howell.

KILLED ON ACTIVE SERVICE.—Sgt. S. Albin; Flt. Sgt. S. J. Beckett; Sgt. G. E. Broughton; Sgt. G. Buckland; L.A/C. F. Chaston; L.A/C. H. C. Cromack; Sgt. W. Dale; Sgt. D. Davies; P/O. A. J. Drake; P/O. R. S. Elsom; Sgt. J. Ferguson; Sgt. J. A. Fox; P/O. G. B. Grenfell; Sgt. F. E. G. Hall; Sgt. J. W. Harris; L.A/C. E. Hartland; L.A/C. K. R. Hickling; Sgt. W. R. Hopcraft; A/C.1 L. J. Horner; Sgt. A. H. Isaac; Sgt. A. Jardine; L.A/C. W. Jones; Sgt. J. Kenny; Sgt. J. C. Keightley; Sgt. C. Lawrence; P/O. F. Leach; Sgt. J. D. Lennon; Sgt. R. G. Macdonald; L.A/C. J. E. Moore; A/C.1 W. Morgan; P/O. A. Murray; Sgt. D. M. Parkes; Sgt. J. R. Parmenter; Sgt. L. Partridge; F/O. A. L. Phelps; Sgt. F. M. Poole; Sgt. T. G. A. Pritchard; L.A/C. R. E. W. Redwood; Sgt. S. W. Shadrack; Sgt. G. T. Spark; Sgt. R. A. Strang; Sgt. V. H. Sweeting; A/C.2 H. Traverse; P/O. W. T. Walton; Flt. Lt. R. J. Warner; L.A/C. C. H. White; Flt. Sgt. R. D. Williams; Sgt. P. J. Woodcock.

WOUNDED OR INJURED ON ACTIVE SERVICE.—A/C.2 J. D. Allen; A/C.1 L. G. Bayliss; A/C.1 R. J. Bone; Sgt. G. Chambers; A/C.1 R. G. Comfort; Sgt. P. E. Harding; A/C.2 R. W. Haywood; Sgt. J. E. Hedges; P/O. P. R. Mellor; P/O. R. Moon; A/C.1 J. E. A. Motyer; Sgt.

ON THE LENINGRAD FRONT: Russian aircrews before starting on a night assignment. The aircraft in the background is a S.B.2.

SERVICE AVIATION

J. Mulholland; Sgt. A. J. V. Perry; A/C.2 M. W. Pring; Cpl. E. J. Smith; L.A/C. F. A. Thomas; Sgt. R. F. Thornton; P/O. W. E. Walters; A/C.1 S. G. Whitlock; Sgt. E. C. Wicks.

DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE.—Sgt. V. C. Bond; Sgt. H. S. Cutler; Sgt. L. D. J. Holmes; L.A/C. W. A. Humphrey; Sgt. H. Morton; Sgt. G. Pollard; Cpl. S. G. Ratcliffe; L.A/C. J. Stewart; P/O. D. H. A. Wilen.

DIED ON ACTIVE SERVICE.—A/C.2 P. A. Ahcott; Cpl. H. Bentley; A/C.2 G. H. Bessant; Cpl. J. Butchart; Cpl. J. W. Grainger; L.A/C. E. W. Hale; L.A/C. D. J. A. Hampton; Sgt. J. L. A. Hudson; Flt. Sgt. B. Loxton; L.A/C. C. G. T. Mann; Sgt. T. W. Parry; L.A/C. J. C. Pitt; Sgt. H. Pointon; A/C.1 H. Rowley; Sgt. J. F. Ryan; A/C.1 C. Thatcher; A/C.1 E. Webb; A/C.1 A. Wilson.

Women's Auxiliary Air Force

DIED ON ACTIVE SERVICE.—L.A/CW. E. Deas; A/CW.2 I. M. Varsie.

Royal Australian Air Force

MISSING, BELIEVED KILLED IN ACTION.—P/O. A. R. Menzies; P/O. B. T. Nossiter.

MISSING.—Sgt. J. K. Cullen; Sgt. G. L. Laidlow; Sgt. W. C. H. Ross; P/O. B. J. McClelland; Sgt. K. O. T. Summerville.

KILLED ON ACTIVE SERVICE.—Sgt. J. A. Keer; Sgt. S. F. Smith; Sgt. A. G. Willman.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED ON ACTIVE SERVICE.—Sgt. P. C. Bucknell; Sgt. D. M. Hall; Sgt. T. C. Wills.

WOUNDED OR INJURED ON ACTIVE SERVICE.—Sgt. K. J. Kenyon.

Royal Canadian Air Force

KILLED IN ACTION.—W/O. L. G. Edwards; Sgt. W. T. Tabor.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Sgt. W. P. McCarthy; F/O. C. F. Race; P/O. R. M. D. Robinson; Flt. Sgt. C. J. Wyllie.

WOUNDED OR INJURED IN ACTION.—Sgt. K. W. Hawkins.

MISSING, BELIEVED KILLED IN ACTION.—Flt. Sgt. C. W. Austin; Sgt. F. L. Cunningham; F/O. E. H. Hill; Sgt. P. Kucheryk; Sgt. A. A. Lang; P/O. J. W. McCann; P/O. L. F. McRae.

MISSING.—P/O. C. F. A. Cantin; Sgt. W. H. Duncan; P/O. I. D. Fountain; Flt. Sgt. C. C. Hill; Flt. Sgt. N. R. Learmouth; Sgt. A. O. MacLeod; Sgt. J. J. Pocock; Sgt. F. R. Scott; Sgt. R. H. Scott; Sgt. W. S. Shewell.

KILLED ON ACTIVE SERVICE.—Sgt. J. E. Coombs; P/O. C. H. Lacerte; Sgt. S. H. McBryde; Sgt. J. M. Matheson; Sgt. R. J. Reay; Sgt. D. R. Robertson; Sgt. B. H. Sparrow.

DIED ON ACTIVE SERVICE.—Sgt. S. D. McPhee.

Royal New Zealand Air Force

KILLED IN ACTION.—Sgt. H. I. F. Connelly; Sgt. K. G. McKenzie; Sgt. L. J. Warren; Sgt. H. C. Whitwell.

MISSING.—Sgt. D. D. Maclean; F/O. P. H. Ryan; Sgt. C. J. Shalfoon.

MISSING, BELIEVED KILLED ON ACTIVE SERVICE.—Sgt. E. W. Evans.

KILLED ON ACTIVE SERVICE.—Sgt. R. Hargreaves; Sgt. D. J. Kirkland.

WOUNDED OR INJURED ON ACTIVE SERVICE.—Flt. Sgt. C. A. McDonald.

DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE.—Flt. Sgt. B. J. Grofski.

South African Air Force

MISSING.—2/Lt. H. C. Williams.

KILLED ON ACTIVE SERVICE.—Major H. M. C. Inglis; Lt. G. R. Norenius.

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Royal Air Force

KILLED IN ACTION.—Sgt. R. Court; Flt. Sgt. W. Dewhurst; Flt. Lt. C. L. N. Johnson; Act. Sqn. Ldr. P. L. Keeble; Sgt. H. G. Lester; Sgt. W. S. Walker.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—P/O. M. W. T. Kidson.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Sgt. R. D. Ash; Sgt. R. H. Beattie; Sgt. P. W. Bland; Sgt. J. Brown; Sgt. R. B. Fielding; P/O. F. G. Hart; P/O. D. R. Hockaday; Sgt. H. D. McColl; Sgt. J. F. McGee; F/O. D. A. A. Romans, D.F.C.; Sgt. C. F. Ryall; Sgt. T. P. Wright.

WOUNDED OR INJURED IN ACTION.—Flt. Sgt. W. G. L. Brown; Sgt. J. S. Groves; Flt. Sgt. H. K. Smallwood; Flt. Sgt. H. R. McM. Stroud.

BATH, FOOT, AIRMEN, FOR THE USE OF: An ablutionary study from North Africa.

DIED OF WOUNDS OR INJURIES RECEIVED IN ACTION.—Sgt. H. E. Game; Sgt. R. Jackson; Sgt. G. H. Surridge.

MISSING, BELIEVED KILLED IN ACTION.—Sgt. R. Bayley; Sgt. F. Briggs; Sgt. T. B. Bywaters; Act. Sgt. M. J. Culclough; P/O. T. B. Crowfoot; Sgt. J. Denny; Sgt. H. Hancocks; Sgt. M. J. Howe; Sgt. S. G. Jenner; Sgt. R. W. Lovell; Sgt. W. S. Mason; Sgt. L. F. Meadows; Sgt. J. W. McL. Merry; P/O. D. P. Munns; Flt. Sgt. G. D. Nash; F/O. K. J. A. Reed; Sgt. W. S. Rendall; Sgt. B. S. Robertson; P/O. P. D. Smale; Flt. Lt. G. B. Smyth; Sgt. K. P. Stibbs; P/O. J. D. Turner; Sgt. D. C. Ward; Sgt. A. G. Willans; Sgt. T. Wood.

MISSING.—Sgt. P. J. Anderton; Flt. Sgt. D. D. Baird; Sgt. M. A. Ball; Sgt. H. H. Barnard; Sgt. J. J. Barton; Sgt. W. E. Bates; Sgt. A. L. Bell; Sgt. J. E. Bellamy; Sgt. E. A. Blake; Sgt. S. Brans; Flt. Lt. A. Brindley; Sgt. R. Brooker; Sgt. J. H. Brooks; P/O. J. M. Bryce; Act. Flt. Lt. R. D. W. Carrington; Sgt. W. Chester; Sgt. J. C. Clarke; Sgt. S. W. Cole; Sgt. P. C. Cottle; Sgt. G. H. Cross; Sgt. R. W. Davison; Sgt. E. G. Edwards; Sgt. B. V. Ekbery; Sgt. R. J. Emms; Sgt. J. G. Ferris; Sgt. S. Fitton; Sgt. J. A. Fleming; Sgt. D. D. Garbett; Sgt. M. J. Gardner; Sgt. H. E. Goldsack; Sgt. W. Gorman; Sgt. P. C. Harrison; P/O. D. L. Heming; Act. Sqn. Ldr. C. E. Hill, D.F.C.; Sgt. G. F. Hitch; Act. Sqn. Ldr. J. Hobbs; Sgt. J. Holmes; Sgt. E. H. Hooper; Sgt. C. B. Horne; P/O. H. Johnson; Sgt. W. R. Johnstone; Sgt. K. Jones; Sgt. R. Jones; Sgt. D. F. J. Jupp; Act. Sqn. Ldr. J. G. Kerry, D.F.C.; Sgt. T. G. Knowles; Sgt. R. A. Larcombe; Sgt. M. D. Lawlor; Sgt. S. R. Lowe; Sgt. J. McDonald; Flt. Sgt. F. Maxfield; Flt. Sgt. I. R. Miller; Sgt. S. A. Miller; W/O. W. N. Moore; Sgt. E. R. Moss; Act. Flt. Lt. R. L. Moss; P/O. D. B. Murdock; Sgt. R. P. Nicholls; Sgt. S. Nicholson; Sgt. A. C. Orr; Sgt. S. J. Page; Act. Flt. Sgt. W. T. Palmer; Flt. Lt. G. N. Parker; Sgt. P. R. Parsons; P/O. A. J. Penman; Sgt. T. L. H. Piddock; Sgt. R. Pierpoint; Sgt. H. L. Pitchforth; P/O. F. J. Pook; Sgt. N. A. Revitt; Sgt. B. L. Rogers; Flt. Sgt. A. Sayner, D.F.M.; Sgt. N. R. Sedgwick; Sgt. E. N. Smith; Sgt. J. B. Stephens; Flt. Sgt. B. G. Stretch; P/O. G. R. Tart; Flt. Sgt. J. Taylor; Sgt. G. H. Thornley; Act. Sqn. Ldr. P. L. Underwood, D.F.C.; Flt. Sgt. P. W. S. Varley; Sgt. B. W. Vaughan; Sgt. A. A. Walker; P/O. R. B. F. Walker; P/O. F. A. S. Wallis; Sgt. D. Wallsh; Sgt. W. C. Warne; P/O. P. P. Whitley; Wing Cdr. R. K. Wildey, D.F.C.; Sgt. G. C. Willis; Sgt. R. Wilson; Flt. Lt. K. F. J. Winchester.

MISSING, BELIEVED KILLED ON ACTIVE SERVICE.—Cpl. E. K. Ford; Sgt. H. J. B. Harrison; Sgt. A. R. Mott.

KILLED ON ACTIVE SERVICE.—Sgt. L. A. G. Buckton; Sgt. G. S. Calder; P/O. R. Franks; P/O. J. Herrington; Sgt. T. G. Masters; Sgt. R. R. Stewart; Sgt. R. H. Worrall.

WOUNDED OR INJURED ON ACTIVE SERVICE.—Sgt. C. Day; L.A/C. F. G. Grainger; Cpl. E. Stripp; Flt. Sgt. L. W. Whieldon.

DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE.—A/C.2 R. A. Candler; L.A/C. L. Farmery.

DIED ON ACTIVE SERVICE.—A/C.2 W. A. Barton; L.A/C. G. W. Blackburn; A/C.2 F. Bottoms; L.A/C. P. P. Frost; A/C.1 J. Henderson; Act. Sgt. H. McLean; L.A/C. T. Muirhead; A/C.1 R. J. Pryce; W/O. D. B. Ross; A/C.2 A. G. Stevens; A/C.1 R. J. Sullivan.

Royal Australian Air Force

WOUNDED OR INJURED IN ACTION.—Flt. Sgt. J. M. Rogers.

MISSING.—Sgt. E. L. Anderson; Flt. Sgt. R. A. Buntine; Flt. Sgt. L. J. H. Govett; Sgt. R. V. Hall; Flt. Sgt. E. T. Hiskens; Flt. Sgt. T. H. Howlett; P/O. J. Johanneson; Sgt. W. B. Knox-Williams; Sgt. J. E. Martin; Sgt. V. O. Noonan; Flt. Sgt. A. A. C. Peters.

KILLED ON ACTIVE SERVICE.—Sgt. B. F. Pearce.

Royal Canadian Air Force

KILLED IN ACTION.—Sgt. R. J. L. Cole; P/O. L. C. R. Leach; Flt. Sgt. C. G. Maclennan; Sgt. R. A. Patenaude.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Flt. Sgt. W. W. Fairbrother.

WOUNDED OR INJURED IN ACTION.—Flt. Sgt. H. G. Brydon; Sgt. G. F. Calver; Sgt. G. T. Chretien; Flt. Sgt. C. G. Crombie; Sgt. W. R. Reid.

DIED OF WOUNDS OR INJURIES RECEIVED IN ACTION.—Sgt. J. S. Anderson.

MISSING, BELIEVED KILLED IN ACTION.—Sgt. I. Arbuckle; Sgt. R. G. Blair; Sgt. J. W. Dubroy; Flt. Sgt. A. G. Lee; Flt. Sgt. G. E. Lewis; Sgt. J. A. Longley; Sgt. L. Lowe; Sgt. A. V. Milot; Flt. Sgt. J. T. Ratcliffe; Sgt. E. E. J. Regis; Flt. Sgt. E. St. A. Richardson; Sgt. T. R. Taylor; P/O. M. M. Tomlinson; P/O. A. D. Walker.

MISSING.—Sgt. R. T. Barber; P/O. C. E. Bell; Flt. Sgt. E. R. Bergquist; Sgt. R. G. Brasnett; Flt. Sgt. P. Carter; Flt. Sgt. D. W. Congdon; Sgt. R. Dempsay; Sgt. J. R. W. Grant; Sgt. E. S. Green; Flt. Sgt. H. A. Grover; P/O. W. J. Hedley; Sgt. J. P. Jolley; Sgt. W. W. Lott; Flt. Sgt. D. L. Morrow; Sgt. G. D. Murray; Sgt. G. F. J. Phalempin; Flt. Sgt. J. De F. Russell; Sgt. V. D. Savage; P/O. D. P. Scott; P/O. L. R. Scourfield; Flt. Sgt. J. F. Streeting; P/O. D. G. Thompson; Sgt. W. A. Wakeman; F/O. E. W. Wallace.

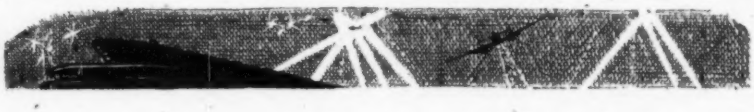
KILLED ON ACTIVE SERVICE.—Sgt. A. N. Foster; Flt. Sgt. H. E. Peters; P/O. C. C. Shadle; Sgt. D. H. Stewart.

DIED ON ACTIVE SERVICE.—Sgt. W. J. B. Bennett; P/O. J. D. Phelan.

Royal New Zealand Air Force

MISSING, BELIEVED KILLED IN ACTION.—Sgt. J. C. Brockett; Sgt. F. W. O'Sullivan; F/O. J. M. Paape; Sgt. N. E. Stone; Sgt. A. J. Tanner.

MISSING.—Act. Flt. Sgt. A. H. Cunningham; Sgt. W. F. Enor; Sgt. E. G. Firth; P/O. R. S. Longuet; Sgt. C. W. R. Macfarquhar; P/O. R. K. Marshall; Sgt. L. H. Parkinson; Sgt. T. C. B. Pike; Sgt. R. J. Roe; Sgt. V. Watters.

South African Air Force

MISSING, BELIEVED KILLED IN ACTION.—Air Sgt. R. J. Behrens; 2/Lt. C. R. Bruton Simmonds; Lt. W. J. Duplessis.